The Electrical Industry's Weekly Magazine

June 11, 1956

Electrical World

Price 35 Cents

A McGraw-Hill Publication

Don't Sell Stores Management Short

.....page 113

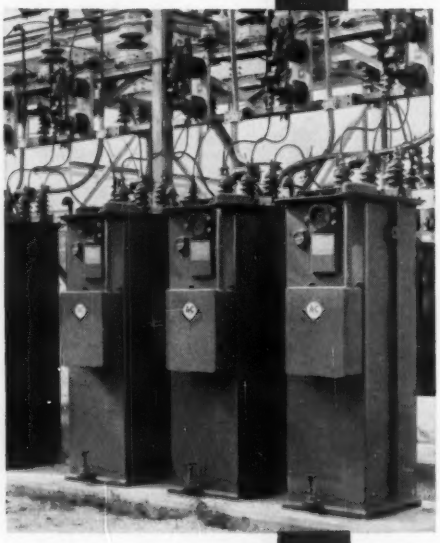
Highlights of the EEI Convention

.....page 97

Fast Delivery from

Nationwide Field Stocks

keeps regulators operating at their best



Here's what happened when a northern utility called an Allis-Chalmers office for regulator parts. Thanks to Allis-Chalmers nationwide stocking program, the parts were on hand. Next morning these parts were at the utility location and the regulator back on the line.

That's everyday service from Allis-Chalmers. A-C people understand your need for continuous operation and they cooperate in helping you get it. Field stocks and field service are designed to help you get the most profit from your regulator operation.

Next time you consider a voltage regulator purchase, consider that you're buying regulation, not just a regulator. You'll go Allis-Chalmers all the way — because Allis-Chalmers field regulator service goes all the way to meet your needs.

Find out for yourself. Ask about A-C regulator service. Call an Allis-Chalmers office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4842

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A-C ALLIS-CHALMERS

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol 145 No. 24 **June 11, 1956**

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In cleaning this wing fuel tank, Capital Airlines selects Hazacord cables for their ability to withstand mechanical abuse as well as contact with cleaning compounds, acetone, hydraulic oils and high-octane gasoline.

where high octane fumes require maximum safety, airline maintenance shop demands Hazacord cables

In 1952, Capital Airlines installed heavy duty Hazacord cables on all their portable tools and explosion-proof trouble lamps. The change was made only after Capital officials had investigated cords supplied by many leading manufacturers and were fully convinced that Hazacord provided the safest possible service where high octane fuel and vapors were present.

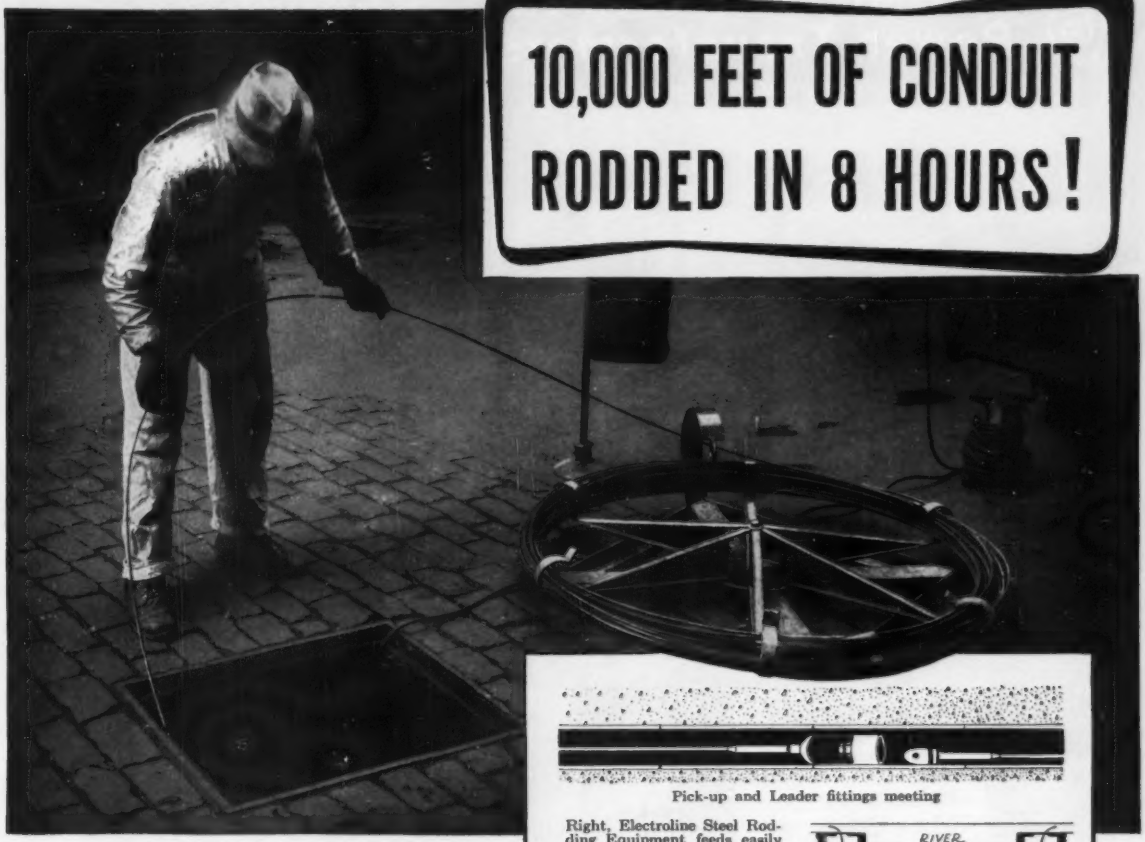
Today, the company still uses Hazacord exclusively for this type of work. According to Capital's Safety Director, C. F. Schaub, here's why:

"The cords used in aircraft maintenance work get rough handling and frequently come in contact with chemicals, such as cleaning compounds, paint thinner, acetone and hydraulic oils, that weaken cord sheaths badly. Then, too, you've got to use these cords inside plane wings and parts of the fuselage where gas vapors are highly concentrated. It doesn't take much imagination to guess what'd happen if a cord shorted there. We have to use the very safest—Hazacord!"

Hazacord can help you solve your cable safety problems too. For full details, contact your nearest Hazard representative or write for Bulletin EW-451, Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, N. J.

3171

10,000 FEET OF CONDUIT RODDED IN 8 HOURS!



Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.

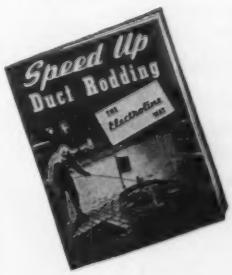
EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

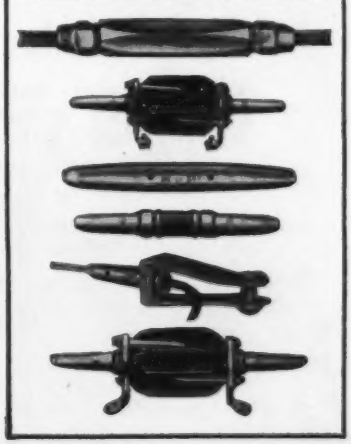
- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.



OTHER *Electroline* PRODUCTS



Electroline Company

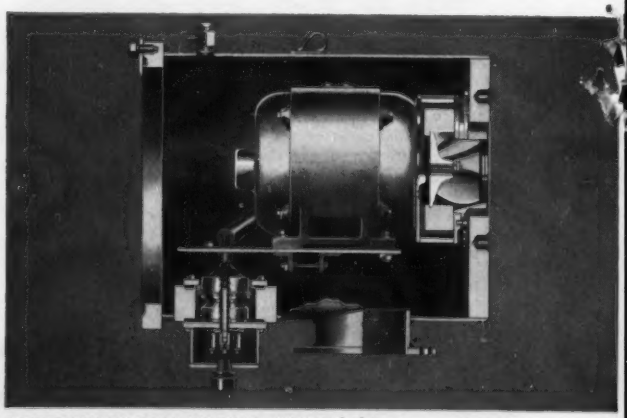
4121 South La Salle St., Chicago 9, Ill.
In Canada: POWERLITE DEVICES, LTD., TORONTO

IMPORTANT MILESTONE of 25,000,000 KVA of FOA capacity shipped by G.E. was reached earlier this year. Increased purchases mean next 25 million KVA should be built by 1961. Unit was shipped upright for easy installation with all accessories on the same flatcar.

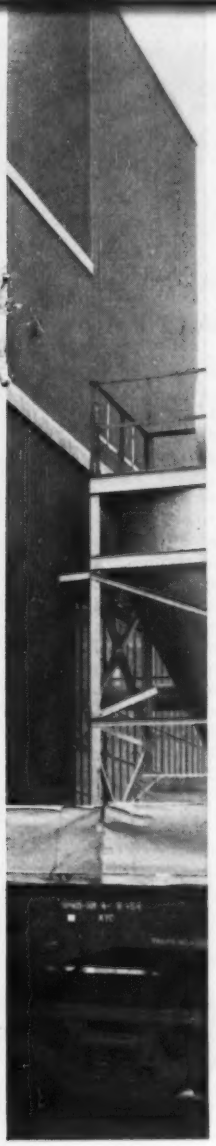
*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your large power transformer investment, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements and few failures reduce outages.



EXCEPTIONALLY RELIABLE PUMP MOTOR is key to acceptance of FOA units—fewer than ten have ever been removed from service for any reason. Pump can be mounted in the ideal hydraulic position above unit coolers.



Utilities save $14,000,000 in 19 years by using G-E FOA power transformers

Milestone of over 25,000,000 KVA of forced-oil-air cooled capacity in service typifies big, first-cost savings available to utilities.

Large capital savings may be possible when you purchase a power transformer. Consider cooling methods. Earlier this year, the power transformer containing General Electric's 25 millionth KVA of FOA (forced-oil-air cooled) capacity was shipped. Compared to the price of more costly units which would have been built with other types of cooling, utilities saved over $14,000,000 in capital expense.

Such first-cost savings are available to power transformer users who choose FOA cooling. In other areas too, such as reduced BIL (basic impulse insulation level), three- or single-phase, and auto- versus conventional transformers, significant capital savings may be possible for a specific application. These savings are made possible by continual product improvements.

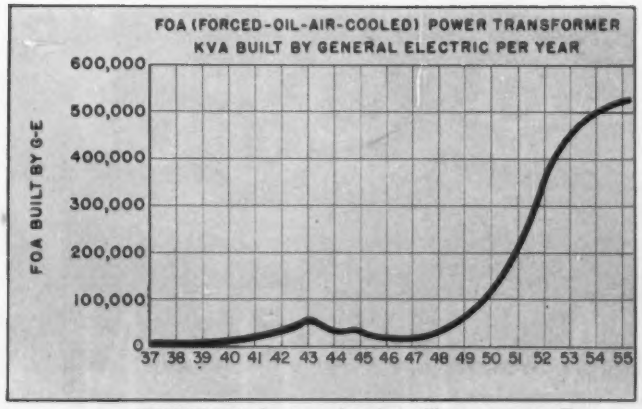
IMPORTANT FEATURES of FOA cooling are the directed-flow concept, the reliability of the oil pump, and the ability to operate for a specified period without auxiliary power. The directed-flow design, introduced by G.E. in 1937, coordinates the amount, velocity, and paths of pump-driven cooling oil. This cost reduction is made possible, basically, by substituting low-cost electrical energy (to operate pump motors) for the high-cost extra copper and steel that would be required by self-cooled designs.

OIL PUMP RELIABILITY, which permits the G-E pump to be located in the optimum hydraulic position on top of the unit cooler—giving a positive oil pressure inside the heat exchanger—is proved by the fact that fewer than 10 pumps, out of the nearly 2000 in service, have ever required removal for any reason. At least one hour's operation at full load, without auxiliary power, depending on previous loading, permits the application of FOA units even in unattended substations.

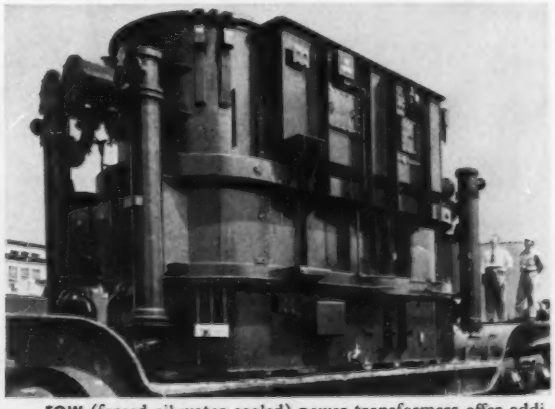
These are examples of features designed to give you a low purchase price. There are more. And, combined with other features that give low operating, installation, maintenance and engineering costs, they make your General Electric Power Transformer an *Optimum Investment*. General Electric Company, Schenectady 5, New York. 421-40

Progress Is Our Most Important Product

GENERAL ELECTRIC



TREND TO FOA shows accelerating utility acceptance. Economy and reliability have led to fact that 65% of large power transformer KVA, currently being shipped by G.E., is FOA.

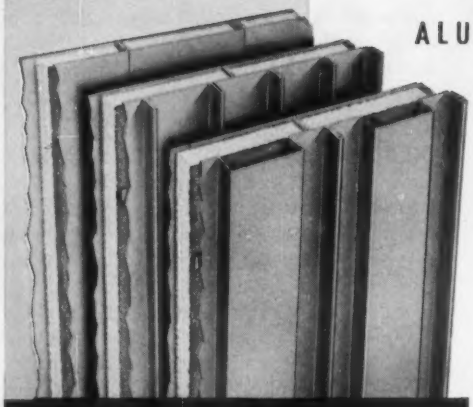


FOW (forced-oil-water cooled) power transformers offer additional economies where adequate water is available for cooling transformers. Shown is 275 MVA unit.

INSULATED METAL WALLS

for POWER and STEAM GENERATING PLANTS

ALUMINUM, STAINLESS or GALVANIZED STEEL



FLUSH, RIBBED, or FLUTED
Over-all "U" Factor of Various Types is Equivalent to or Better than Conventional 16" Masonry Wall

In today's modern powerhouses, Insulated Metal Curtain Walls have become the accepted construction. For these necessarily-high structures, light-weight, permanent metal curtain walls offer savings in both cost and construction time that cannot be disregarded . . . in some structures the savings amount to one-half the cost of masonry walls. In recent years, sixty-seven powerhouses have been constructed with Mahon Insulated Metal Walls alone . . . bright metal—aluminum or stainless steel—has been employed for all exterior surfaces or in combination with brick and other materials to produce structures of attractive and distinctive appearance. The powerhouse below is an excellent example. Mahon Insulated Metal Walls are selected in most cases because: (1) Vertical joints between exterior wall plates are invisible—symmetry of pattern is uninterrupted across the wall surface. (2) Walls can be field-constructed up to sixty feet in height without a horizontal joint. These two features which, from an appearance standpoint, are extremely important in powerhouses where high expanses of unbroken wall surface are common, were engineered into Mahon walls to provide a wall surface without unsightly joints. You, too, will want these "better-look" features in the metal curtain wall you select for your next project. See Sweet's Files for information or write for Catalog W-56.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago • Representatives in Principal Cities

Manufacturers of Insulated Metal Walls and Wall Panels, M-Floors (Electrified Cel-Beam Floor Systems), Permanent Steel Floor Forms, Steel Roof Deck and Long Span M-Decks, Rolling Steel Doors, Grilles, and Underwriters' Labeled Automatic Rolling Steel Fire Doors and Fire Shutters.

MAHON

ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH

YOU WANT

- *MAXIMUM FATIGUE RESISTANCE;*
- *SUPERIOR STABILITY UNDER HEAT;*
- *HIGH BURSTING STRENGTH;*
- *ABOLITION OF THE NEED FOR FREQUENT STOP JOINTS, REINFORCED LEAD SHEATH, GENEROUS EXPANSION BENDS, LARGE MANHOLES;*
- *LOWEST LONG-TIME CREEP RATE;*
- *THE RELIABILITY ASSURED BY OUR EXCLUSIVE MANUFACTURING, TESTING AND FIELD EXPERIENCE...*

IN SHORT,

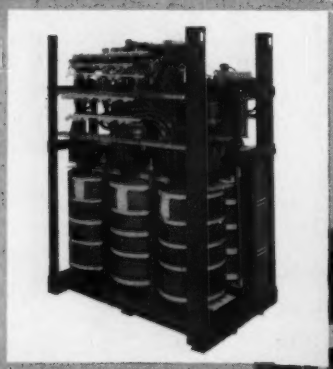
YOU WANT

ROEBLING

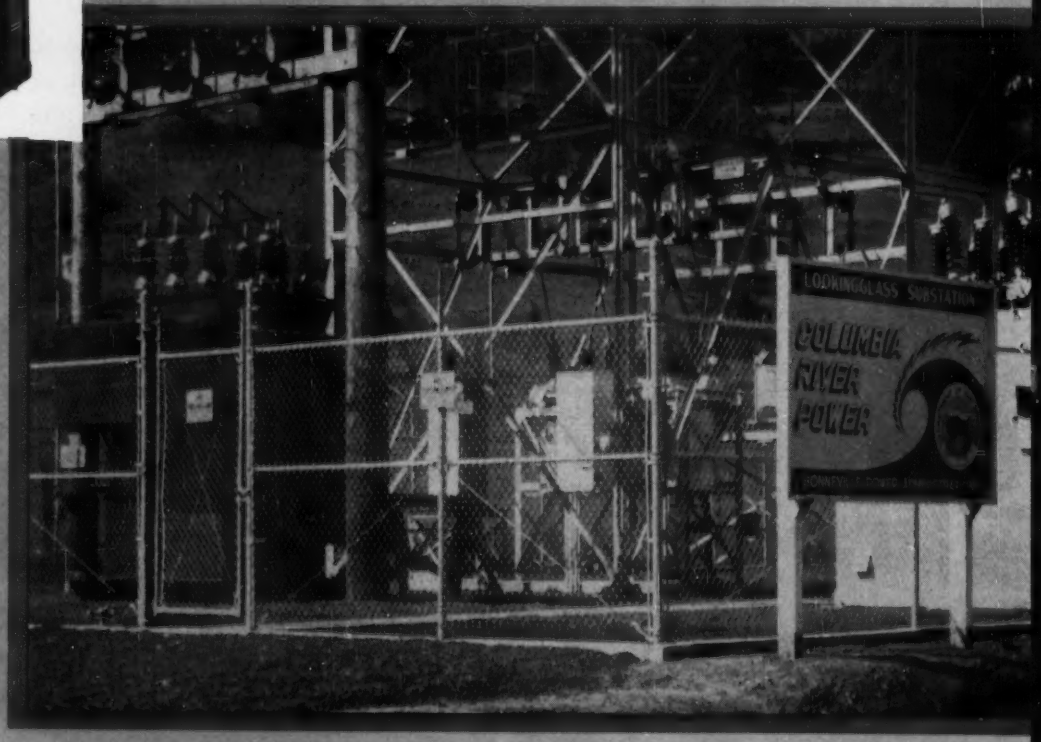
Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3340 GLENDALE-MILFORD RD. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1753 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

If Alice passed through LOOKINGGLASS tonight...

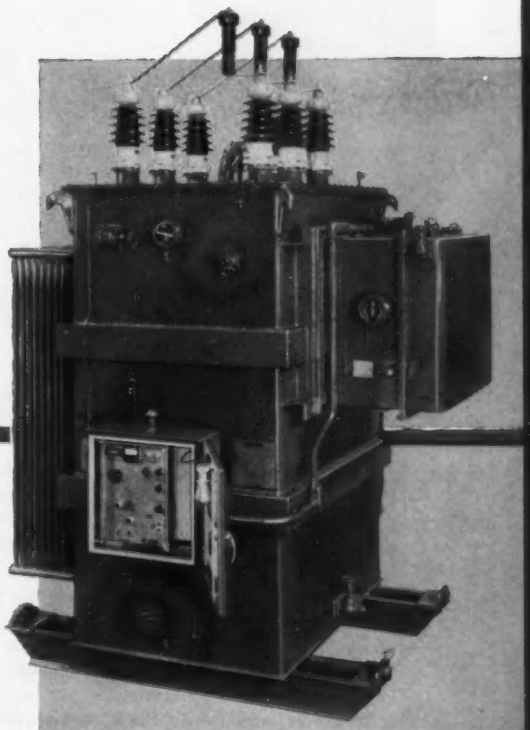


This internal view of the 750-kva Pennsylvania Step Voltage Regulator shows the exciting transformer, in the foreground, and one coil of the series transformer. Note the rigid supports of the LTC tap leads, and the rugged framework which permits the entire internal assembly to be handled as an integral unit.



. . her way would be lighted with uniform voltage supplied by this 750 kva

Pennsylvania Step Voltage Regulator



With this 750-kva Pennsylvania Step Voltage Regulator, the Bonneville Power Administration (U. S. Department of Interior) maintains an even flow of voltage for the Douglas Electric Cooperative, Inc., which serves the Lookingglass Valley and adjacent areas. The unit provides 34,500 volts at a rated current of 125.5 amperes. It is equipped with an automatic load tap changer for plus or minus 10% voltage regulation in thirty-two ⅝% steps. (Three phase, 60 cycles, 55°C. rise, OA-outdoors.)

If Alice were to pass through Lookingglass tonight, she would see that many changes have been made since her famous nineteenth century trip to the land of topsy-turvy. One particularly marvelous sight would be found just about everywhere: in the streets, in homes, in stores, in barns.

That marvel would be the steady, never-flickering glow of light produced by *well regulated* electricity. In the town of Lookingglass, Oregon — so named, in 1846, because the reflection of the sun in the green grass of the valley created a mirror-like impression — a 750-kva Pennsylvania Step Voltage Regulator is used to maintain an even voltage throughout varying load conditions. As a result, residents of the picturesque valley can enjoy to the fullest extent *any simultaneous combination* of lights, appliances, and other electrical marvels. Alice could toy and experiment all she wanted to with present day electrical curiosities — even during the peak load hours of the day.

Similar Pennsylvania Step Voltage Regulators are performing identical jobs in many communities throughout the United States — helping to transform this country into an electrical Wonderland from coast to coast.

PENNSYLVANIA TRANSFORMER COMPANY

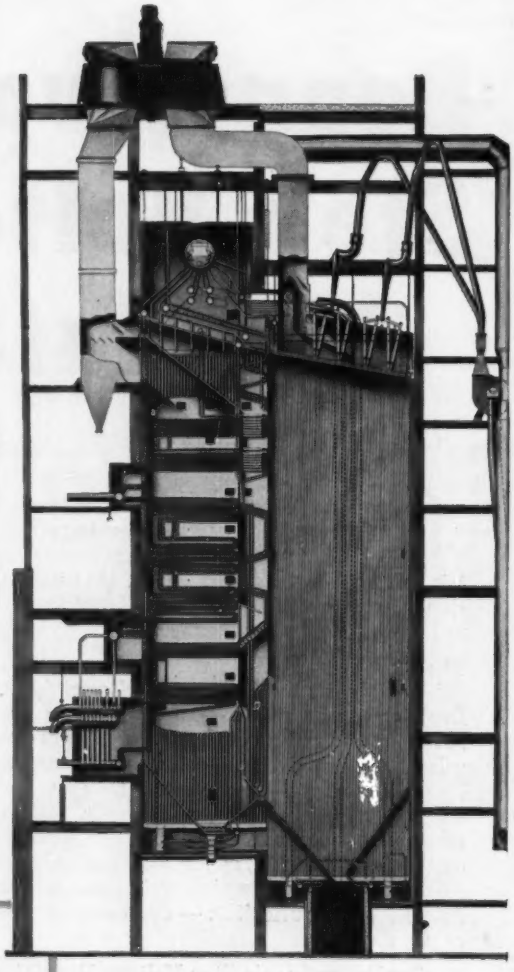
A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

Now on the Line at Duquesne Light

1,060,000 lb/hr

Reheat Steam Generator by FW

Sixth Foster Wheeler Steam Generator at Phillips Station marks latest expansion of Duquesne system ... an expansion that will soon include atomic power at Shippingport, where FW Steam Generators will also serve



The capacity of the Phillips Station of Duquesne Light Company was increased by 156,200 kw when Unit No. 4 went on the line in January 1956. This, the largest and most efficient unit in the Duquesne system, is served by the 1,060,000 lb/hr Foster Wheeler reheat-type steam generator shown at the right.

The addition of Unit No. 4 brings total capability of Phillips Station to 382,000 kw. *All four* of these units are powered by Foster Wheeler steam generators — a tribute to customer satisfaction that dates back to the first installation in 1942.

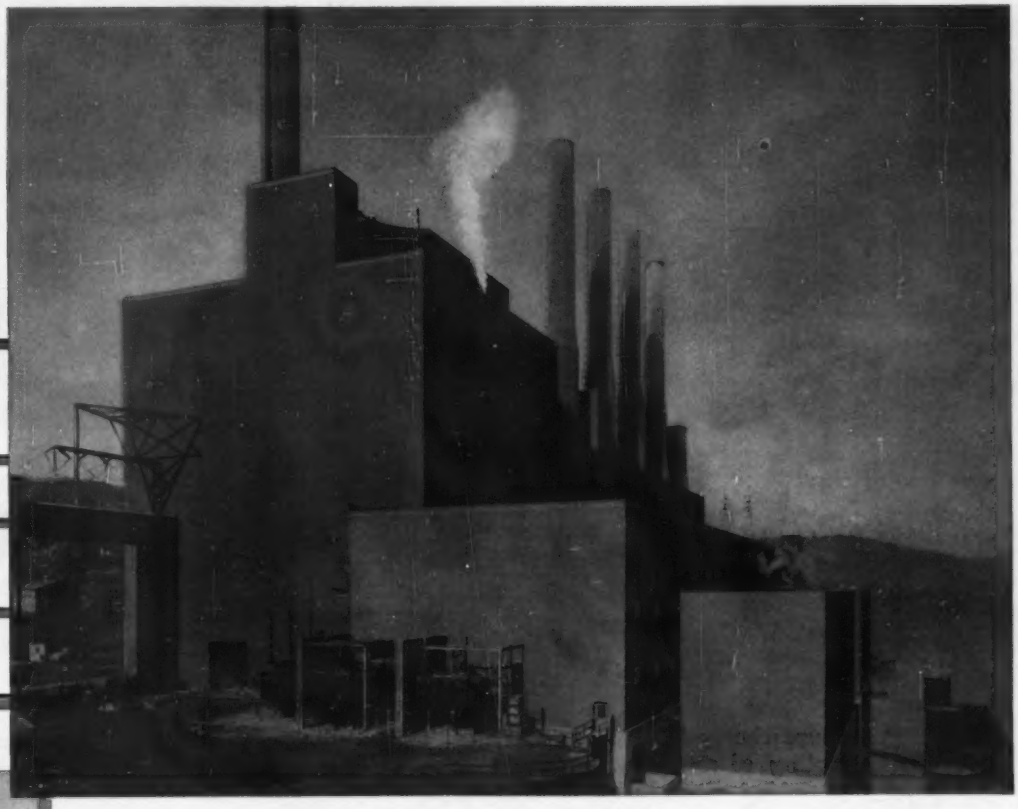
In the nation's first full scale atomic power plant, now under construction at Shippingport, Pa. and scheduled for completion in 1957, two Foster Wheeler steam generators (heat exchangers) will be used to convert heat from the nuclear reactor to 600 psi steam.

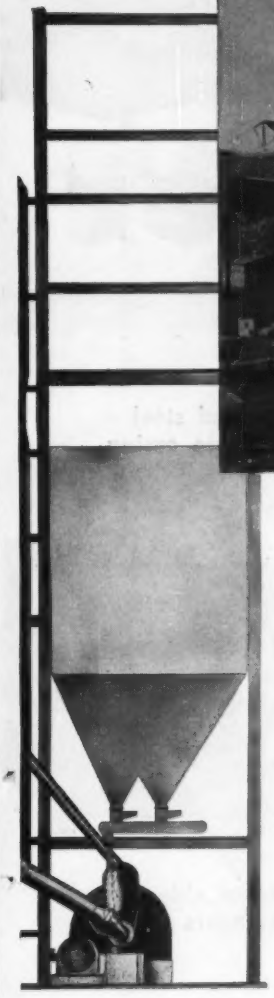
Whatever your Power Plant requirements — from coal or oil firing to nuclear energy — heat engineering by Foster Wheeler means efficient and dependable steam generation at low overall cost. For further information, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, New York.*

FW STEAM GENERATORS AT DUQUESNE'S PHILLIPS STATION

1942 — TWO twin-furnace units, 500,000 lb/hr, 900 psi, 900F
1949 — ONE twin-furnace unit, 700,000 lb/hr, 900 psi, 900F
1950 — TWO twin-furnace units, 700,000 lb/hr 900 psi, 900F
1956 — ONE divided-furnace, reheat unit, 1,060,000 lb/hr, 1850 psi, 1000/1000F

Company's Phillips Station:





The FW steam generator for Unit No. 4 at the Phillips Station above is shown in cross section at the left. It delivers 1,060,000 lb steam per hour at 1,850 psi, 1,000F at the superheater outlet and 1,000 F reheat. The primary steam temperature is controlled at 1,000F over a load range from 689,000 to 1,060,000 lb/hr by spray control. Reheat temperature is also controlled at 1,000F over the same load range by gas by-pass.

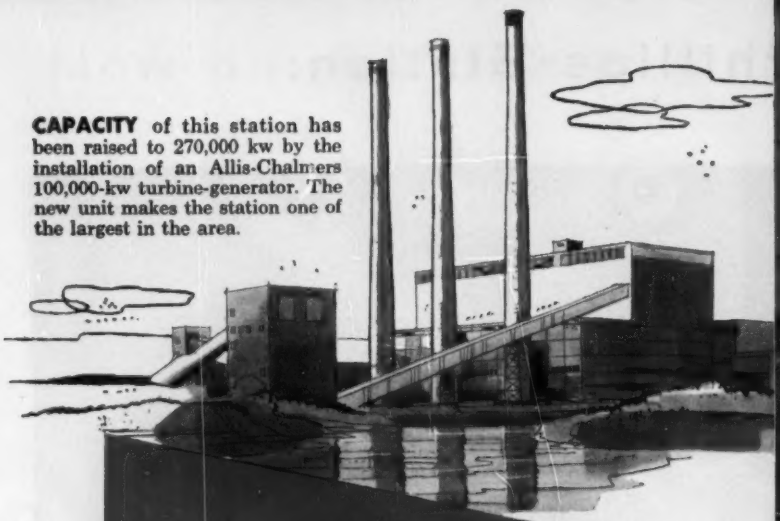
This 44-ft wide furnace is vertically fired by 12 FW intertube burners located in the roof. The furnace is divided into three firing cells; the front, side and division walls containing waterwall surface while the rear wall is of radiant superheater surface. Furnace exit gases are divided into two passes, with convection superheater, convection reheater, and bare-tube economizer in the main pass, and convection superheater and extended-surface economizer in the by-pass section.

Coal for this 1,060,000 lb/hr unit is pulverized by two of the largest ball mills ever installed. These Foster Wheeler D-8D suction-type ball mills have a capacity of 67,000 lb of coal per hour, ground to a fineness of not less than 75% through a 200 mesh sieve and not less than 99% through a 50 mesh sieve. The pulverized coal-air stream is drawn from both ends of the double-ended mills and piped to four distributors near the top of the furnace, each distributor dividing it three ways so that each pulverizer exhaust feeds a burner in each of the three furnace cells. This assures a very even distribution of heat across the furnace.

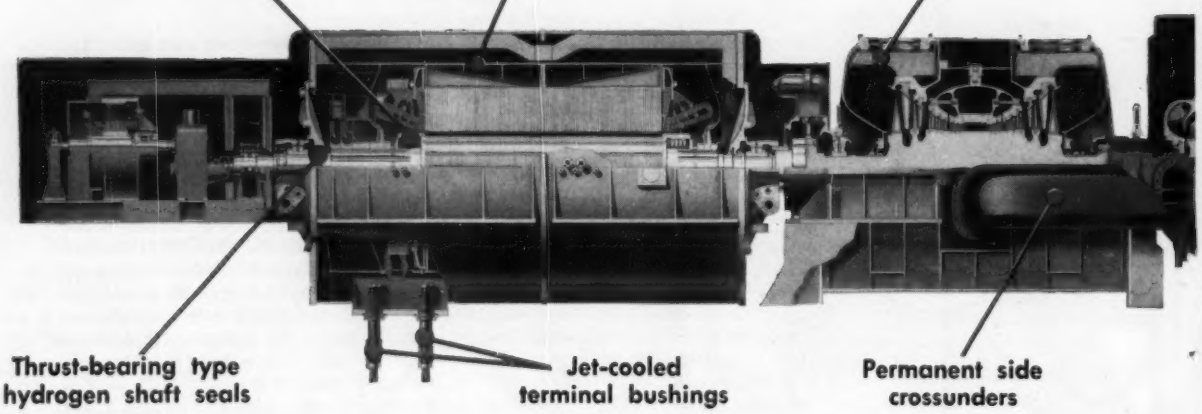
FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

CAPACITY of this station has been raised to 270,000 kw by the installation of an Allis-Chalmers 100,000-kw turbine-generator. The new unit makes the station one of the largest in the area.



Here's MORE Power


Supercharged cooling of rotor
Symmetrical stator with flexible core support
Fabricated steel low pressure casing
Thrust-bearing type hydrogen shaft seals
Jet-cooled terminal bushings
Permanent side crossunders

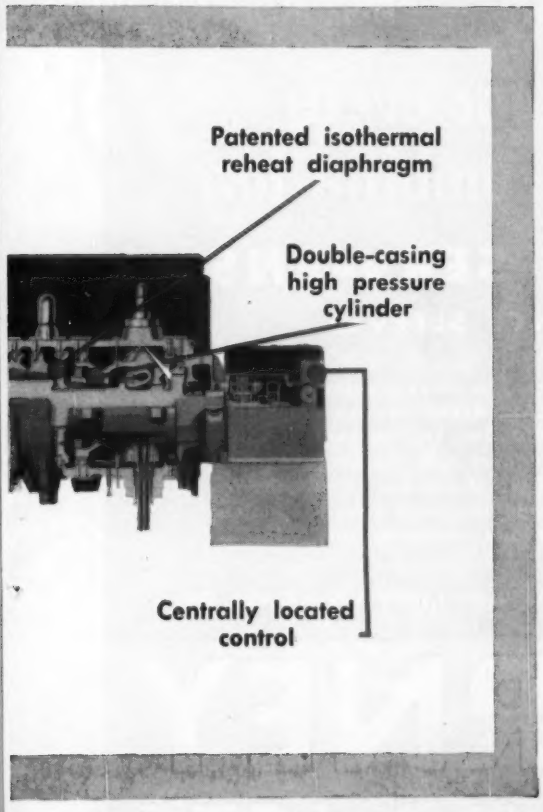
A-C ALLIS-CHALMERS

ALLIS-

STEAM CONDITIONS for this 100,000-kw turbine are 1450 psig, 1000 F inlet, 1000 F reheat, 1.5 inch mercury absolute exhaust. Generator rating is 133,689 kva, 0.85 pf, 13,800 volts, 0.64 short-circuit ratio, at 30 psig hydrogen pressure.

Pioneer Service & Engineering Co., consulting engineers

Pioneering



New 100,000-kw reheat unit in midwestern utility combines side-crossunder, tandem-compound steam turbine with supercharged hydrogen-cooled, 3600-rpm generator.

To meet present and future requirements, this modern Allis-Chalmers turbine-generator combination went into operation recently in a large midwestern utility power plant.

Typical of Allis-Chalmers tandem 3600-rpm reheat turbines for ratings of 75,000 to 250,000 kw, this 100,000-kw unit joins others already proved in operation.

You can continue to look to Allis-Chalmers for MORE pioneering of turbine-generator units engineered to your requirements — up to 500,000 kw. For more information, contact your nearby A-C representative, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4985

CHALMERS

Use 'em for every conductor combination

KEARNEY SERV-ENS

SERVICE ENTRANCE SLEEVES

Between the two bores of each Serv-En is a solid metal barrier that acts as a "spacer" to prevent galvanic action. Also, the bores contain KEARNALENE corrosion inhibitor. Your crews can use KEARNEY Serv-Ens for connecting all combinations of ACSR, aluminum and copper conductors. Plastic caps on each end of the sleeve are color-coded for quick size identification. In addition, each sleeve is plainly marked with its size range and conductor cut-off length.

JAMES R. KEARNEY CORPORATION • 4224 Clayton Ave., St. Louis 10, Mo. • *Canadian Plant:* Guelph, Ont.

329

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY
JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.
The Mark of Quality PRODUCTS

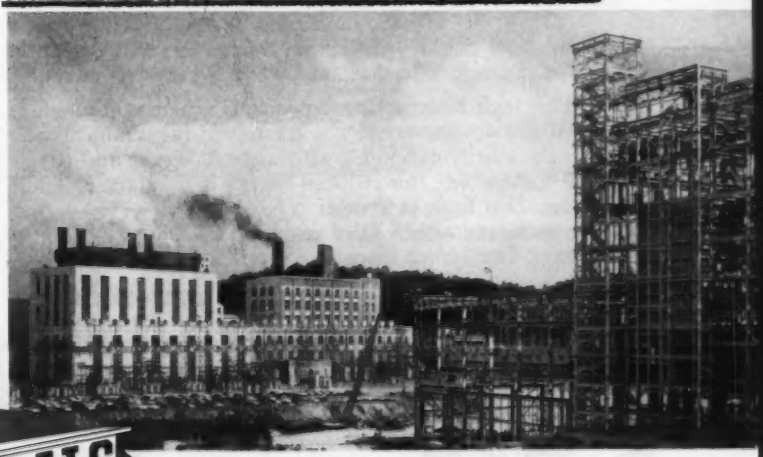
SPECIALIST IN STEEL

This unit of the Gorgas Steam Plant, one of many supplied by Ingalls for the Alabama Power Company, is another in a large series of installations done by Ingalls for power companies in twenty-two different states throughout the North, South, East and Southwest. The structural steel was fabricated at Ingalls' Birmingham Southside plant; the coal bunker was fabricated by Ingalls' affiliate, Birmingham Tank Company; erection was by Ingalls' subsidiary, The Ingalls Steel Construction Company. Field connections on the 3,500 ton installation were made with high tensile bolts for extra rigidity and reduced construction time. Tanks and ducts were also Ingalls-built and erected.

INGALLS

SPECIALIST

Specialist in steel for power plants, Ingalls is ready *today* to help you with speed, economy and the insight of wide practical knowledge. Your inquiries are invited.



FABRICATING STEEL IS OUR BUSINESS

THE INGALLS **IRON WORKS COMPANY**

BIRMINGHAM, ALABAMA

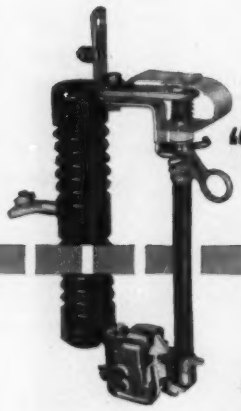
SALES OFFICES: New York, Chicago, Pittsburgh, Houston, Atlanta, New Orleans

Plants: Birmingham, Ala.; Verona, Pa.; Pascagoula, Miss.; North Birmingham, Ala.; Decatur, Ala.

Now....clear 12000 amps

WITH AN OPEN CUTOUT

AT ONLY "EXTRA HEAVY DUTY" COST



S&C's Open Cutout—Type XS—with a newly developed fuse tube—provides the higher interrupting capacity needed on some of your distribution feeders . . . without sacrificing linemen's safety . . . without double-venting . . . without resorting to an oversize bore . . . and without a cost premium.

This high interrupting capacity is achieved through two new developments which result in (a) minimizing the energy developed within the fuse tube and (b) absorbing this reduced energy in a unique recoil mechanism. Low fault interruption has not been sacrificed either. It is assured by a strong, fast-acting flipper.

Specialists in High-Voltage Circuit Interruption since 1910

Handles lightest faults, too!

Re-usable extension rod shortens arc length, reduces gas generation
S&C Positrol Fuse Link permits precise system co-ordination
Strong, canvas-base bakelite backs up fiber liner
30

RATINGS

	Amperes	
KV	Continuous	Interrupting (RMS, Asymmetrical)
7.5	100	12000
15	100	10000

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

ELECTRICAL BUSINESS OUTLOOK

Electrical World
JUNE 11, 1956

Basic material shortages will lengthen lead times on equipment. That's the undertone of the May report of the Business Survey Committee of the National Association of Purchasing Agents.

Aluminum, some copper items, nickel, steel (plate, shapes, structural, pipe, stainless, sheets) and electrical equipment head up NAPA's list of items in short supply.

• • •

Ordering production materials remains pretty much in the 30-to-90 days range. However, the percentage of PA's ordering 60-days ahead increased from 36% in April to 39% in May. Those ordering 90 days ahead went from 26 to 27% while 30-day lead time dropped from 24 to 22%. These slight changes will have their effect on . . .

Lead times for utility equipment. Here's how lead times of major items stood in early May as reported by J. B. Homsher, Gilbert Associates' PA, at the Edison Electric Institute Purchasing and Stores Committee meeting.

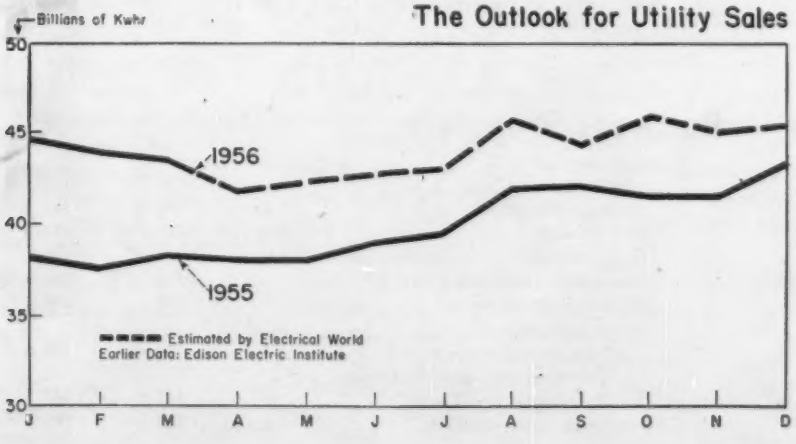
Structural Steel	12 to 20 months	Motors	6 to 7 months
Steam Generators	18 to 24 months	Bare Wire (carload lots)	2 to 4 weeks
Turbine Generators	24 months	Rubber & Lead Cable	4 to 6 weeks
Transformers		Special Cable	6 weeks
Power	6 to 12 months	Paper Lead Cable	12 to 16 weeks
Distribution	stock to 4 months	Std. Pipe (buttweld)	60 days
Switchgear		(If ordered before 4th of month)	
(Incl. Breakers)	6 to 8 months		

• • •

Industry's expansion plans evidently will be reflected in prices you will pay for materials and equipment—especially those depending on materials in critical supply. A special survey by NAPA last month found 76% of the PA's reporting some or considerable effect on current prices from the policy of making price increases to cover all or part of expansion costs. Many felt increased prices may be necessary to recover such costs unless tax relief, depreciation and depletion allowances, and improved worker productivity can take up the slack.

Utility sales in 1956 will most likely exceed EW's estimates (see below) if first quarter performance is any indication. Sales in the first quarter were 1.5% higher than the forecast to post a gain of 15.8% over last year.

The Outlook for Utility Sales



STATISTICS

Available Energy Per Person Jumped 12.8% in U.S. During '55

(Millions of Kwhr)

	Generation: Total Utility Industry	Generation: Other Sources*	Net Imports	Total Available	Population (June 30)	Kwhr Per Person	
1951	370,673	62,685	2,187	435,545	153,383,000	2,840	(up 10.0%)
1952	399,224	63,831	2,269	465,324	155,767,000	2,987	(up 5.2%)
1953	442,665	71,504	2,008	516,177	158,320,000	3,260	(up 9.1%)
1954	471,686	72,959	2,340	546,985	161,183,000	3,394	(up 4.1%)
1955p	546,404	78,497	4,022	628,923	164,280,000	3,828	(up 12.8%)

Notes: * Includes generation of industrial, mine and electric railways
† Estimated by U. S. Bureau of Labor; excludes Armed Forces overseas.
p Preliminary

Source: Federal Power Commission

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	million kw Mar.	92.3	94.2	83.4	10.7
Peak—Class I Systems	million kw Mar.	92.3	94.2	83.4	10.7
Estimated Dec. '56 Peak	million kw Mar.	105.68	105.56	103.41	2.2
Production—billion kwhr	Mar.	50.34	47.99	44.45	13.3
Hydro		11.78	10.63	10.40	13.3
Fuel		38.56	37.36	34.05	13.2
Sales—billion kwhr	Mar.	45.36	45.41	39.86	13.8
Residential		12.42	13.02	11.13	11.6
Commercial		6.84	6.89	6.20	10.2
Industrial		23.69	23.21	20.25	17.0
Other		2.40	2.28	2.28	5.3
Fuel Consumption	Mar.				
Coal—million tons		13.39	13.44	11.51	16.3
Oil—million barrels		6.22	7.10	6.81	−8.7
Gas—billion cu ft		85.17	67.81	83.41	2.1
Net Income Class A & B Co's—$ million	Mar.	117.46	129.26	105.23	11.6
Residential Customers—millions	12 mos.	44.60	44.51	43.34	2.9
Revenue per kwhr	ended	2.63¢	2.64¢	2.68¢	−1.9
Avg kwhr per customer	Feb. 29	2,799	2,778	2,587	8.2
Avg annual bill		$73.67	$73.34	$69.33	6.3

Business Statistics . . .

Indexes: 1947–49=100					
FRB Industrial Production	April	143	143	138	3.6
ENR Construction Cost	May	144.4	143.2	137	5.4
BLS Cost-of-living	Mar.	114.7	114.6	114.3	0.4
NEMA Sales	Mar.				
Insulation materials		168	163	160	5.0
Electric appliances		120	109	117	2.6
Wholesale prices	Mar.				
Motors and generators		126.9	126.6	120.5	5.3
Transformers and regulators		133.1	131.2	127.3	4.6
Switchgear and fuses		147.8	147.5	135.5	9.1
GNP—annual rate—$ billion	1st Qtr.	398.5	397.3	375.3	6.2

Your Business

Need a new idea? There are probably scores of ideas on your very problem right in your own organization or your own family. Whether you're looking for a new promotion gimmick or a novel vacation plan, they can be yours for the asking.

"Brainstorming" is the technique for getting these ideas out of peoples' minds and down on paper. You could call it an "idea conference." Alex Osborn, creator of "brainstorming," found it highly successful in his advertising firm and many other enterprises.

Rules are simple, but the more rigidly followed, the better the results. The Associated Business Publications offers these suggestions:

1. Collect a group of about 12 people for best results, but it will work with as few as three. No need to select all people with previous experience on the problem at hand.

2. At least two days before the meeting, tell participants the problem to be brainstormed. Make sure you define the problem and give brief explanation.

3. Pick a moderator, someone who will keep the meeting moving and contribute ideas himself. He must be thoroughly familiar with the rules and must enforce them quickly and rigidly.

4. Once the meeting begins, judgment must be ruled out. If someone starts to criticize or even give an opinion, the moderator literally must shut him up —and quickly. An easy method for doing this is to ring a bell or pound the table.

5. Explain that free wheeling is welcome. The wilder the idea the better. It is easier to tame down than to think up. Assure participants no one will laugh at an idea, even though it may be unusual.

6. Explain that quantity of ideas is the purpose of the meeting. The more ideas, the more chance of some good ones. Have someone write them down as they are expressed.

7. Explain that if someone has a suggestion related to one just voiced he should snap his fingers. Then the moderator should call on him next so that the free flow of improvement on ideas can be maintained. This is called "hitch hiking."

Par for a three-minute session is about 14 ideas—usually several pretty good ones. But "brainstorming" takes practice. Once the ideas are collected, the person with the problem can best choose the ones that apply.

You'll find the full story on "brainstorming" in Alex Osborn's book, "Applied Imagination" published by Scribners.

Your Health, Rex H. Wilson, MD, Medical Director, B. F. Goodrich Co

In this day of wearing shorts and exposing the legs to public view anything which mars the attractiveness of the lower limbs is a source of anguish to some. Enlarged, dilated, tortuous veins are common. They can occur anywhere but usually are found on the backs of legs and about the ankles.

The veins return used blood along with waste products from the body tissues to the heart and lungs for purification. The blood moves under very little pressure. It can stagnate easily, forming clots and obstructions. When an obstruction occurs, the vein below it dilates and becomes thickened. If the vein is injured or infected it also becomes varicosed. An abdomen which contains a lot of fat or a large tumor can, by pressure on the pelvic veins, cause obstruction and dilation of the leg veins.

Small varicose veins do not cause symptoms. The large "snake-like" veins cause pain, aching and itching. The legs tire and cramp easily. Fluid may accumulate about the lower legs and ankles. The pain is usually less on walking and more on standing. There is darkening and irritation of the skin about the varicosity.

A blow over a large varicose vein can cause an ulcer to form. Occasionally clots that have formed in the varicosed veins break loose and travel in the blood stream. If they lodge in a vital organ they can cause serious and sometimes fatal results.

Varicose veins can be injected with chemicals to close them. Some can be stripped out entirely. Elastic stockings are prescribed for some.

Varicose veins are both unsightly and dangerous. Too often they are allowed to progress until they become incapacitating.

WASHINGTON COMMENT

Outlook: Stepped-Up Reactor Program

Hearings on reactor insurance indicate government liability coverage; Gore bill sessions point to federal reactors only to advance technology

Recent congressional hearings point to a stepped-up program of nuclear power reactor building. This accelerated program may come from both government and private industry projects.

Behind this outlook lies the recently completed hearings, first on the question of greater insurance protection for reactor projects, and second, on the bill by Sen Albert Gore (D-Tenn.) which proposes that the government build six power reactors.

The insurance problem already has been tackled. Sen Clinton P. Anderson (D-N. M.), chairman of the Joint Atomic Energy Committee which held the hearings on both insurance and the Gore bill, has sponsored insurance legislation. His bill (S 3929) provides for government liability insurance up to $500 million on each reactor project.

A companion bill has been sponsored in the House by Rep Melvin Price (D-Ill.). Rep W. Sterling Cole (R-N.Y.) has introduced another bill on the same subject in the House. His measure (HR 11242) is not as encompassing in its protection as the Anderson measure.

The significant point, however, is that the bills point to a determination to settle the insurance question. The indications are that some form of government liability insurance for atomic projects will come out of the present session of Congress. Thus a roadblock may be eliminated from greater private industry construction of power reactors.

With regard to the Gore bill, there seems to be general agreement on these two main points:

1. The question of whether the U. S. is ahead or behind Russia and England in reactor development is academic. What is important is that this country needs to build more reactor types and build them in a hurry to insure its position of world leadership.

2. A desire to keep the public versus private power issue out of the program. This may be recognized in whatever legislation is drafted.

As the hearings were nearing their end, Anderson gave some indication of what might be contemplated. Addressing a witness, Andrew J. McMahon, president of the Utility Workers Union of America, who opposed the Gore bill, Anderson said:

"I think the program that may be contemplated probably does not run contrary to what you are talking about. When you give a contract to an operator to build the plant, there is no way of putting the government into the utility business, and you naturally make a contract with some private utility to take the power or the steam or whatever it may be and turn it into electric current."

It appears that the Committee is agreed on the need for an accelerated reactor construction program; that the government will undertake to build additional full-scale reactors purely to advance reactor technology. It is doubtful that any elements will be incorporated in this proposal which would result in legislation being delayed on the basis of a public versus private power fight.

TECHNICAL NOTES

Wind-driven generators must operate in parallel with relatively large systems to avoid frequency variations.

Accident prevention has two approaches: Plan to prevent the accident, and apply precautions to limit damage if an accident occurs.

Drawn-aluminum sheath on control cable is rugged enough to protect the conductors without conduit or armor in many portions of power plant, commercial, and industrial installations.

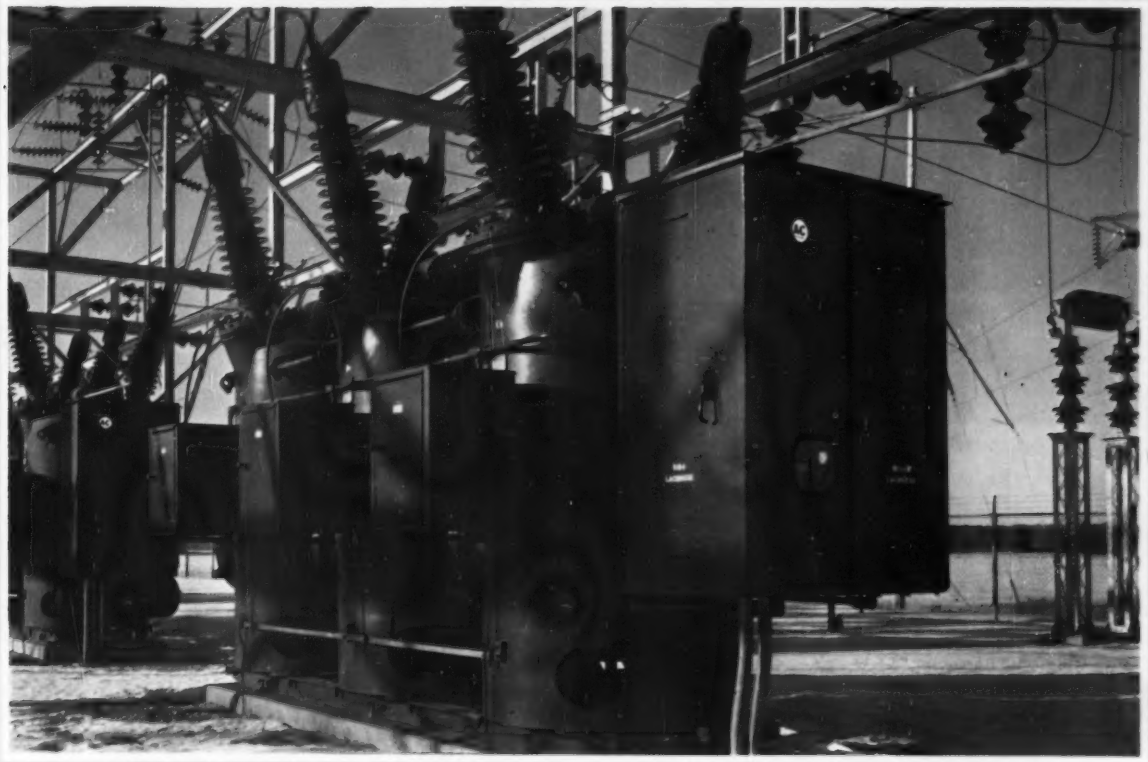
Wind-driven generators are not economical in Europe unless average wind velocity exceeds 9 mph.

Nuclear power plants must keep extensive official records of personnel exposure to radioactivity and radiation site surveys to protect against damage claims.

Wind-driven generators produce power only when wind exceeds a minimum velocity. Below this velocity, their induction generators draw excitation from the line.

Maintenance personnel for nuclear plants must be more numerous than for conventional power plants because possible presence of radioactivity requires high degree of station cleanliness. Radioactivity also limits time a repairman can work.

You Get MORE Positive Protection with Allis-Chalmers Breakers



This 115-kv Allis-Chalmers breaker with Mechanically Trip-Free *Pneu-Draulic* operator is installed in a substation of a large Midwest utility.

All Allis-Chalmers Breakers Are Mechanically Trip-Free

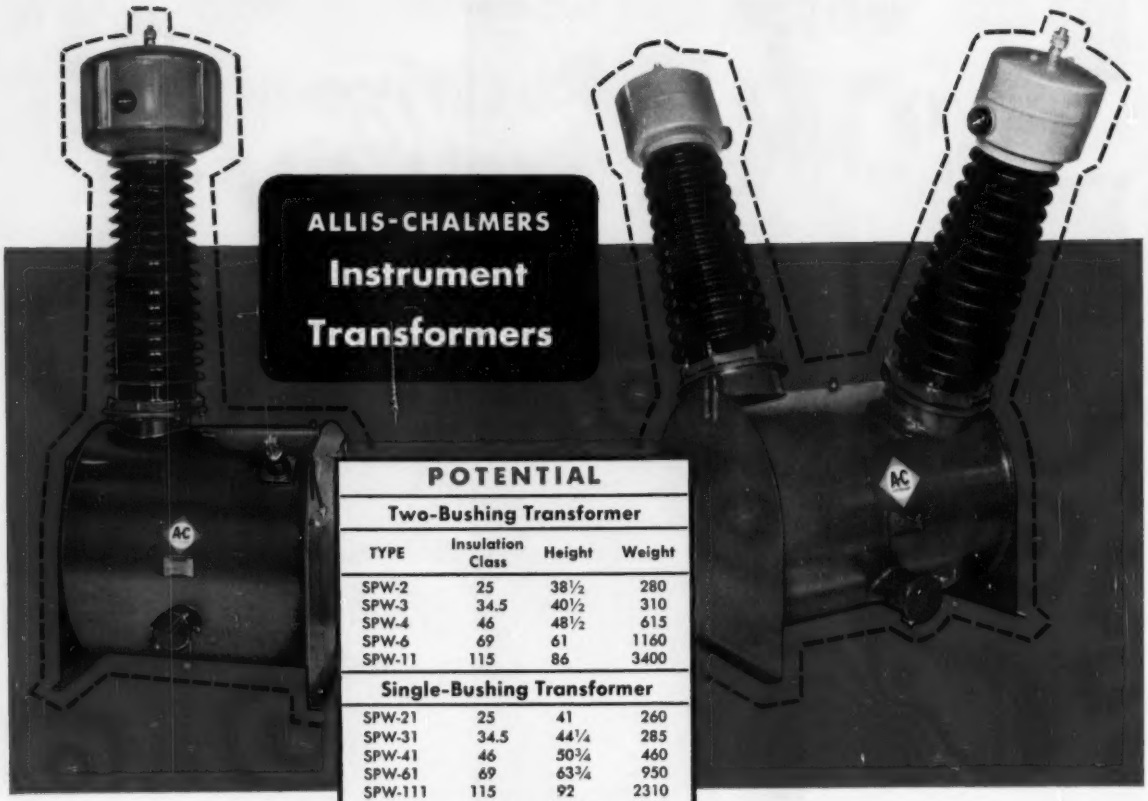
● Contacts open at full speed under *all* conditions *on every Allis-Chalmers breaker.* Simple uncoupling linkage permits contacts to open at full speed regardless of the position of the closing mechanism. *Pneumatically or hydraulically trip-free breakers cannot give you this protection.* This principle of breaker operation has been a feature of Allis-Chalmers breakers since 1933.

For details of this and other features, such as the *Pneu-Draulic* operator and the completely tested *Turbo Jet* interrupter, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic and *Turbo Jet* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-4980



POTENTIAL			
Two-Bushing Transformer			
TYPE	Insulation Class	Height	Weight
SPW-2	25	38½	280
SPW-3	34.5	40½	310
SPW-4	46	48½	615
SPW-6	69	61	1160
SPW-11	115	86	3400
Single-Bushing Transformer			
SPW-21	25	41	260
SPW-31	34.5	44¼	285
SPW-41	46	50¾	460
SPW-61	69	63¾	950
SPW-111	115	92	2310
SPW-131	138	112	3510

Advanced Design Features Mean...

Savings in Size and Weight

Now, reductions in size and weight make Allis-Chalmers potential transformers easier to handle—simplify installation procedures.

Compact Design results in improved performance in both ratio and phase angle.

New Ratings. This line of potential transformers has also been expanded to include higher voltage insulation classes.

Advanced Corona-Free Design principles enable these transformers to withstand long continued voltage stresses and short-time surge conditions. Internal corners and coil edges are protected by formed insulating channels which fit close to coil surfaces —effectively prohibiting formation of corona and the development of leakage paths.

Maintenance-Cutting Construction Features are incorporated, such as all-welded, hermetically sealed tanks to extend life of coils and insulation. The new one-piece high voltage porcelain bushing incorporates the same corona-free design features that are used in the transformer, thus assuring long trouble-free life.

Get All the Facts on these modern, lightweight transformers. Contact your nearby Allis-Chalmers district office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for more information.

LIVE BETTER ELECTRICALLY

A-5087

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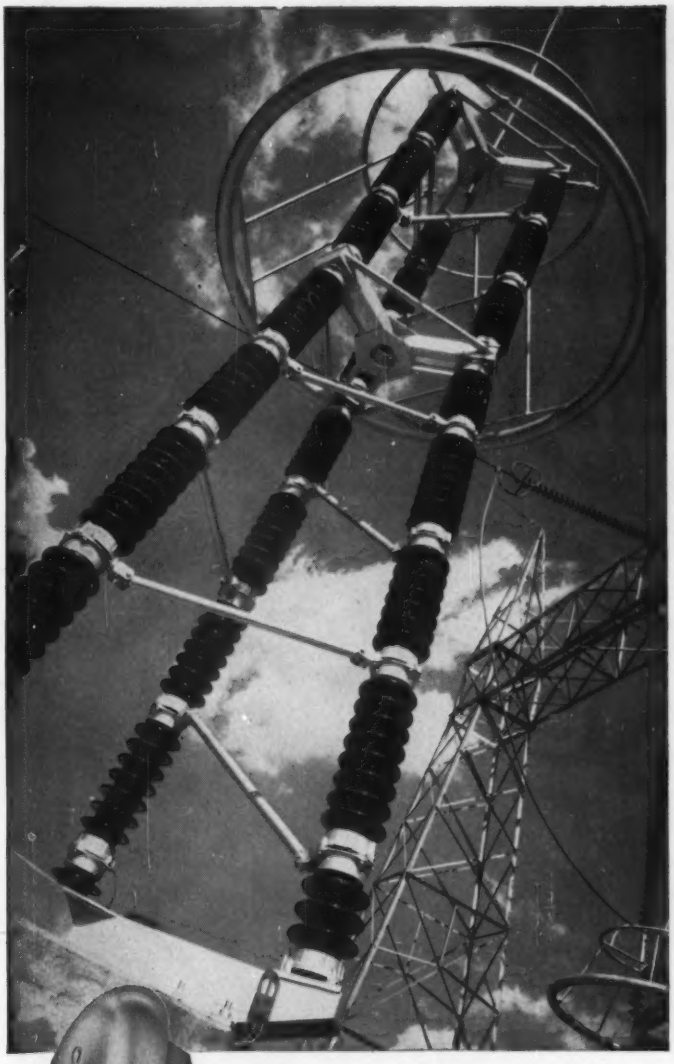

World's largest self-supporting lightning arrester. Designed by Westinghouse Electric Corporation. Being used to gain more data about corona and the transmission of high voltage electricity.

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Oval Neck
Silicon Bronze
Connector Bolt

ARRESTED!

Costly Corrosion
Costly Breakdowns
Costly Complaints

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Whatever your equipment—whatever the corrosive agent—you get added insurance... you're assured trouble-free performance from Harper Everlasting Fastenings.

They're made exclusively from the corrosion-resistant metals. They're available without delay in a wide range of types, sizes and alloys. More than 7,000 different items are carried in stock.

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Reliable

SERVICE WEDGE CLAMPS

demonstrate that
the PROOF of a product is in

EXPERIENCE

EXPERIENCE in manufacturing
EXPERIENCE with use

When a manufacturer makes, and his customers use literally millions of his product, EXPERIENCE obviously indicates that the product is right. The valuable experience gained in manufacturing so many wedge type clamps means that utilities can buy and use them with confidence in their performance, their safety and their cost.

Reliable started with the telephone drop wire clamp, then came the concentric cable clamp and a little later the Service Wedge Clamp. Utilities from coast to coast know from experience that Reliable Service Wedge Clamps in a wide choice of types and sizes meet *all* their requirements.

FOR SERVICE DROP CABLES

Reliable offers 27 catalog numbers to provide the widest range of sizes and types in the industry.

Specify and be sure to get the product that experience has proved best . . . Reliable Service Wedge Clamp.

Reliable ELECTRIC COMPANY

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

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CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

These four Elliott 600-hp, 514-rpm vertical weather-protected induction motors drive circulating water pumps in an outdoor location.

ELLIOTT *Weather-Protected* MOTORS

SIX FULL-FLEDGED HURRICANES have hit these Elliott weather-protected motors in two years of service in a southern utility plant right on the Atlantic Coast. Winds of over 100 miles an hour swept the station, and a driving, blinding deluge of rain battered the installation from all angles. But the rain couldn't penetrate and stop the Elliott motors. They kept right on operating, snug and dry on the inside. Elliott's superior design has proven itself in every climate and weather condition you can think of—snow, sleet, salt spray, dust, mist, fog or wind-blown rain.

Elliott weather-protected motors are the safe, economical answer to many of today's drive problems, which could otherwise be met only by added building construction or a totally-enclosed motor. They need no roof, no cored foundations, no duct work, and present no difficult maintenance problems. Over 500,000 hp now in service. Ask your local Elliott field engineer or write for Bulletin PB 1400-6. Address Elliott Company, Ridgway, Pa.

ELLIOTT Company

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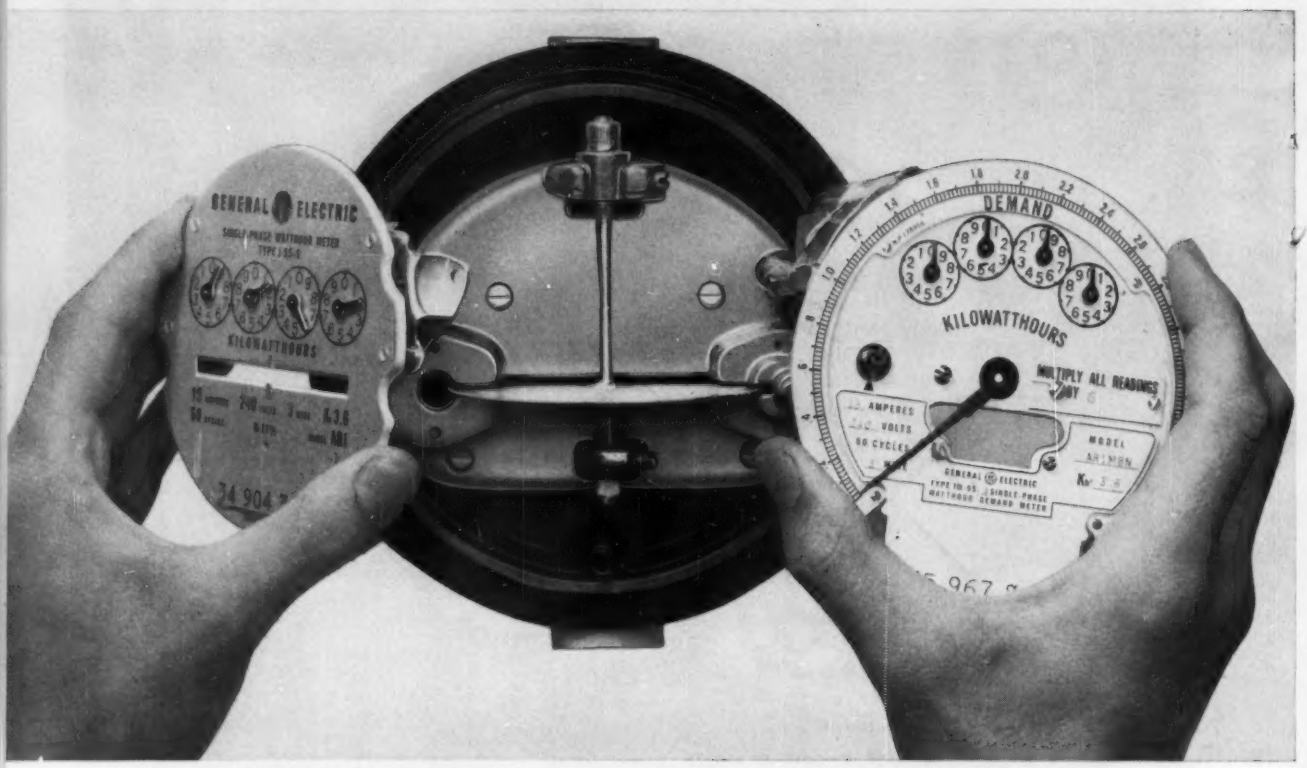
DEMAND METERING



DEMAND REGISTERS OFFER MAXIMUM FLEXIBILITY, MAY BE INSTALLED ON ANY G-E SINGLE-PHASE OR POLYPHASE METER

Demand Registers: The Most Reliable Means to Low Cost Demand Metering

- Increasing number of utilities are taking advantage of the benefits offered by demand registers
- Flexibility of register assures reduced inventory and operating costs
- Greatly reduced testing and maintenance expenses have resulted from improved designs

The dependable low-cost operation of mechanical demand registers has led to their increasing acceptance by the utility industry.

General Electric engineers have released test results which give assurance of increased reliability of demand registers. These tests show that the life of the register rotor has been extended up to 10 years. This fact means that the register will need testing and maintenance only during periodic meter tests. This assurance of dependable performance offers the utilities unlimited savings in their demand metering operation.

DIRECT GEAR DRIVE . . . Not only is the register on the same testing basis as the meter but also the demand register possesses the same stability of calibration as the watthour meter. This high degree of accuracy remains unchanged during life, and thus assures reliable operation for years. In comparison with other types of demand metering devices, the register is relatively unaffected by such variables as friction and climate.

REGISTER FLEXIBILITY . . . The versatility of design of General Electric's demand register offers the opportunity of converting the register to different scale classes, different electrical ratings, or any

available time interval. Standardization on one register ratio with a change in only the multiplier is but one of the many cost-saving methods which is available with only a demand register.

REDUCED INVENTORY . . . The opportunities for reduced inventory are unlimited with the use of demand registers. Any stock single-phase or polyphase watthour meter can be converted to a demand meter merely by substituting a demand register. This adaptability which results in reduced inventory and operating costs is unique only with demand registers.

IN SERVICE . . . A watthour meter can be readily converted to a demand meter simply by the interchanging of registers. Also, quick, easy, accurate and low-cost field testing can be realized with demand registers. With the use of a G-E self-checking adapter, the need for elaborate testing equipment and costly hours of labor is eliminated.

These facts offer you the greatest possible assurance that General Electric's demand registers are your most reliable means to low-cost demand metering.

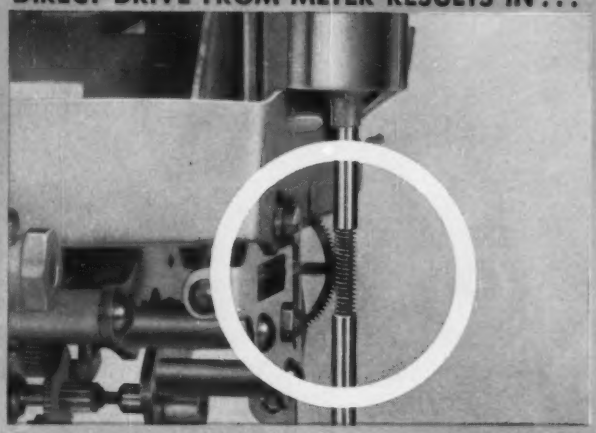
MANY UTILITIES . . . Increasing numbers of utilities are taking advantage of the benefits offered by demand registers. Here are but a few: Commonwealth Edison Company, Wisconsin Electric Power Company, Kansas Power and Light Company, Duke Power Company, Pacific Gas and Electric Company, Southern California Edison Company, Public Service Company of Oklahoma, and New Orleans Public Service Inc.

FOR MORE INFORMATION . . . If you would like more information on General Electric's mechanical demand registers, write to Section 621–12, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

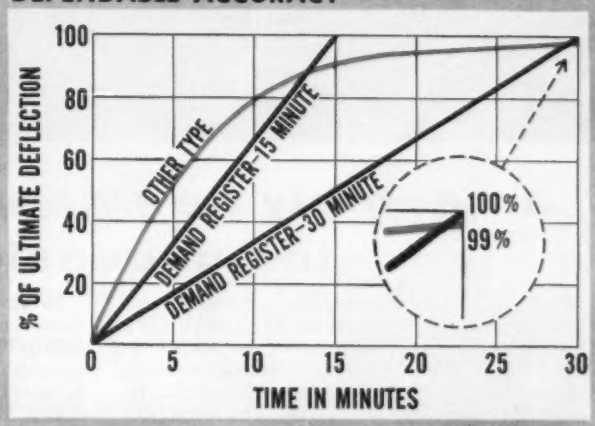
GENERAL ELECTRIC

DIRECT DRIVE FROM METER RESULTS IN . . .



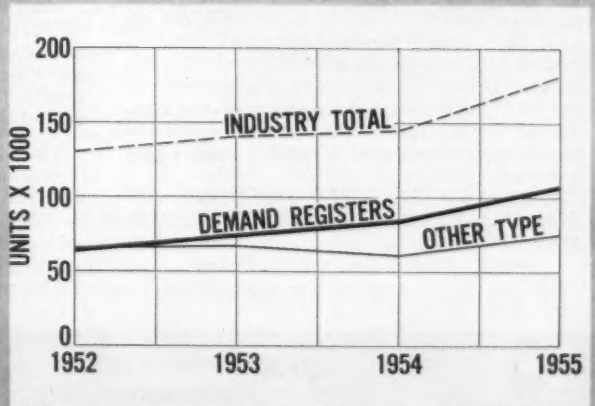
DIRECT GEAR DRIVE from the meter assures sustained accuracy for years.

DEPENDABLE ACCURACY

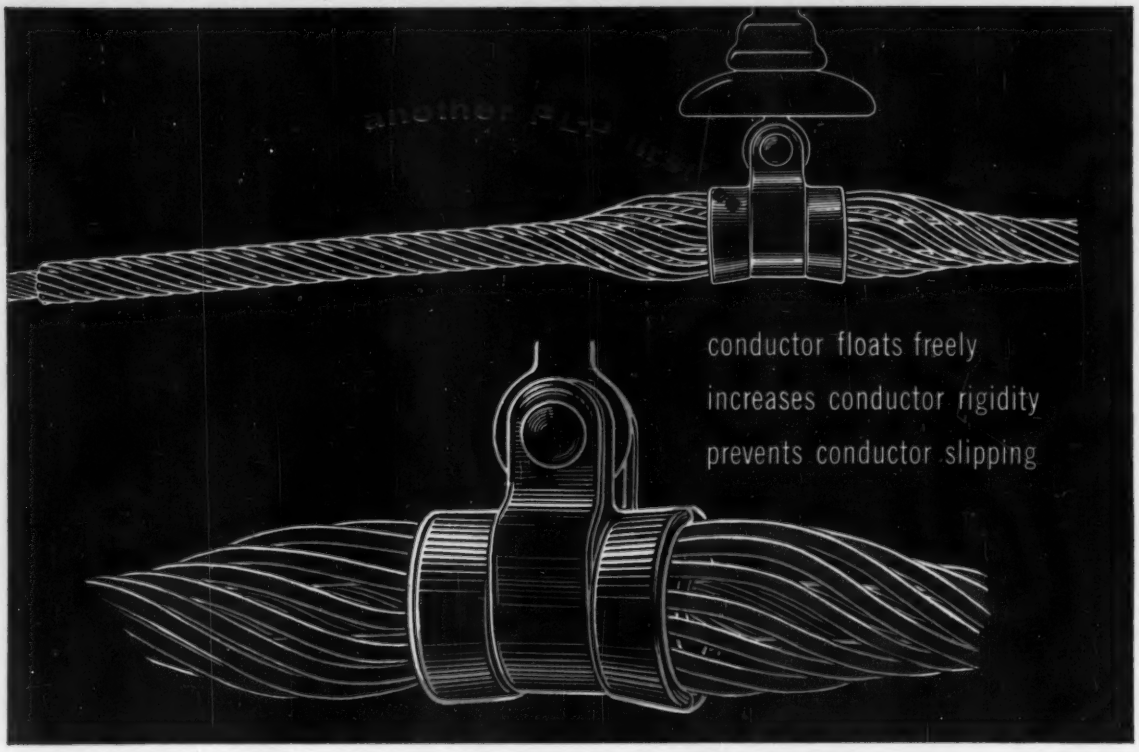


ONLY REGISTERS reach 100% of average demand after rated time interval.

INCREASING UTILITY USE



INCREASING USE of demand register results from dependable operation.



an entirely new concept in suspension design

After five years of intensive laboratory research and field experience, Preformed Line Products Company announces the ARMOR-GRIP SUSPENSION. This is not just a modification of the conventional clamp—in fact, in a sense it is not a "clamp" at all. The ARMOR-GRIP SUSPENSION is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Armor Rods which distribute their pressure over a relatively large area. An ingenious relation between rods and housing prevents the suspension assembly from slipping longitudinally. The expanded configuration of the PLP rods also adds rigidity to the conductor while slight vertical resilience of the conductor mounting eliminates a steep stress gradient.

THE ARMOR-GRIP SUSPENSION ELIMINATES CONCENTRATED CLAMPING STRESSES.

In severe accelerated vibration tests, conductor mounted in the PLP ARMOR-GRIP SUSPENSION outlasts conventional clamp assemblies many times—in fact, no conductor failures have ever occurred under the ARMOR-GRIP SUSPENSIONS in these tests. Thousands of ARMOR-GRIP SUSPENSIONS have been installed during the past four years—with NO reported case of unsatisfactory performance.

Yet with all these functional advantages, the ARMOR-GRIP SUSPENSION is very easy to install. Simplicity of design has eliminated many parts—there are less than one-half the number contained in a conventional clamp assembly. Only one nut to tighten.

The ARMOR-GRIP is immediately available in conductor sizes in the ranges of 336,400 cm, 477,000 cm, 795,000 cm, 954,000 cm ACSR and All-Aluminum. Other sizes will soon be available and can be produced on request.

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PREFORMED LINE PRODUCTS COMPANY
5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO
TELEPHONE: CLEVELAND EXPRESS 1-3571

"DESIGN OF PIPING SYSTEMS"

(Second Edition)

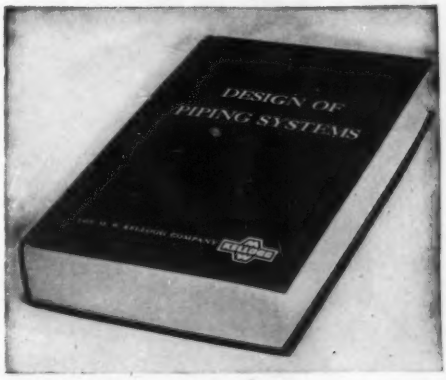
CONTENTS

- Strength and Failure of Material
- Design Assumptions, Stress Evaluation, and Design Limits
- Local Components
- Simplified Methods of Flexibility Analysis
- Flexibility Analysis by the General Analytical Method
- Flexibility Analysis by Model Test
- Approaches for Reducing Expansion Effects: Expansion Joints
- Supporting, Restraining, and Bracing the Piping System
- Vibration Prevention and Control
- History and Derivation of Piping Flexibility Analysis
- Derivation of Acoustic Vibration Formulas
- Charts and Tables

M. W. KELLOGG'S DESIGN EXPERIENCE KEEPS PACE

As temperatures and pressures increase in steam-electric power plants, the problems involved in designing, engineering, and fabricating main and rheat steam piping multiply themselves many times over. This emphasizes, more than ever, the value of the long experience, in the laboratory and on the job, of The M. W. Kellogg Company —leader in the power piping field.

More evidence of M. W. Kellogg's accumulated piping design experience and ability to tackle each new power piping project in its stride, is the company's new 400-page book, "Design of Piping Systems"—recently published by John Wiley & Sons, nc. The most comprehensive work ever made available publicly on the physical design of piping, it is one of the many ways M. W. Kellogg cooperates with consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment. An outline of contents is shown above.



Sales of this limited edition of "Design of Piping Systems" have already exceeded expectations. You can be sure of getting your copy by writing now to The M. W. Kellogg Company. Ask also for the new, free 12-page booklet, "Piping Flexibility Analysis," which shows how M. W. Kellogg's various flexibility analyses techniques can cut piping design and construction costs.

FABRICATED PRODUCTS DIVISION

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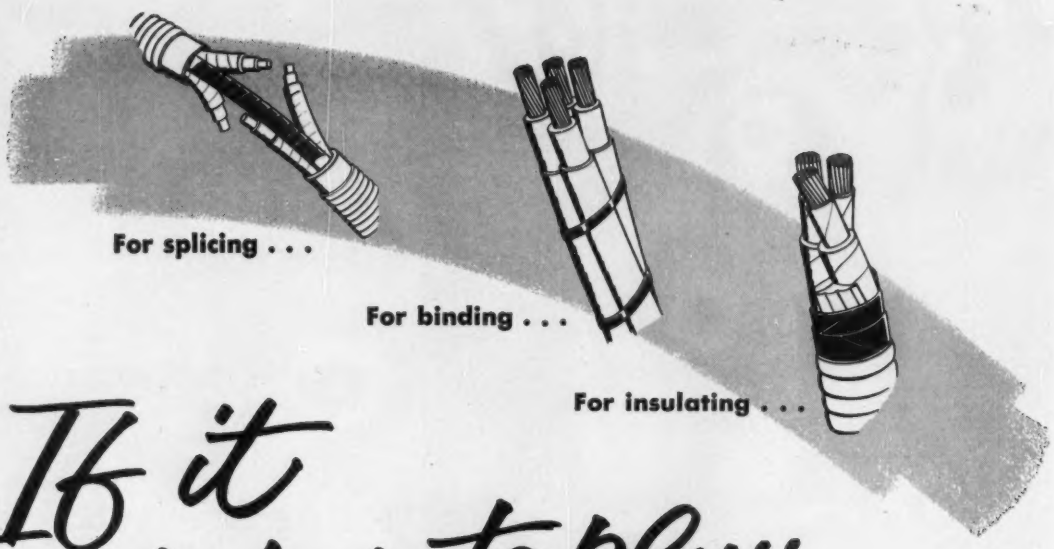
POWER PIPING—THE VITAL LINK



If it takes tape . . .

DON'T CHANCE

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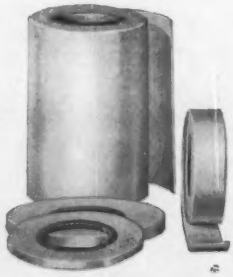
CABLE BINDING TAPE

CABLE JACKET TAPE

NEOPRENE SPLICING TAPE

FRICTION, RUBBER & PLASTIC TAPE

LAMINATED & REINFORCED INSULATION



IT . . . CHASE IT!

Whatever your electrical insulating requirements, you can trust Chase to make the tape which will meet your highest performance standards. Combining high dielectric and tensile strength, Chase cable tapes provide ideal insulation . . . assure long life even under the toughest conditions.

To meet the broad demands of the Electrical Industry, Chase offers a complete line of tapes in a variety of materials, including cotton, glass, synthetic fabrics, and unsupported plastics, rubber, neoprene, butyl, polyethylene or Dupont Mylar®. For complete data on the Chase products which interest you, simply check the attached coupon and send to CHASE & SONS, INC., Randolph, Mass.

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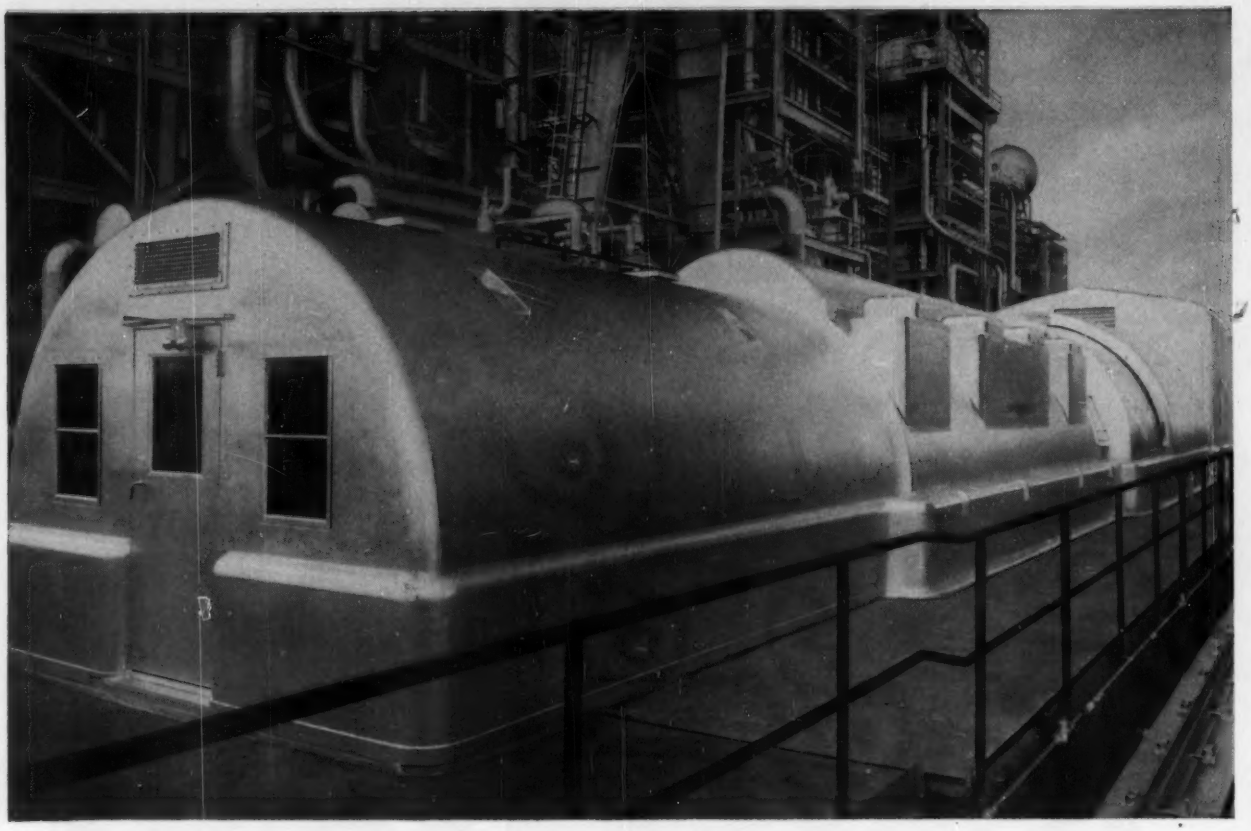
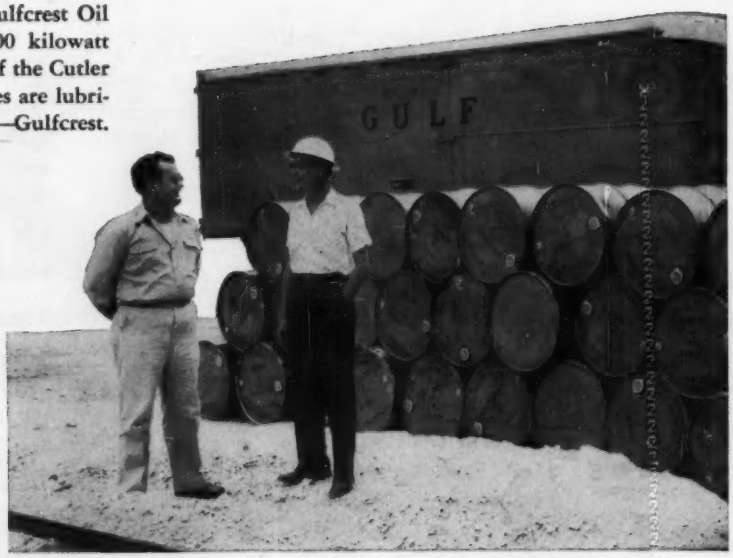


Part of the 100-drum shipment of Gulfcrest Oil which will lubricate the new 150,000 kilowatt turbine. This brings the total output of the Cutler Plant to 370,000 kilowatts. All turbines are lubricated with the finest in turbine oils—Gulfcrest.

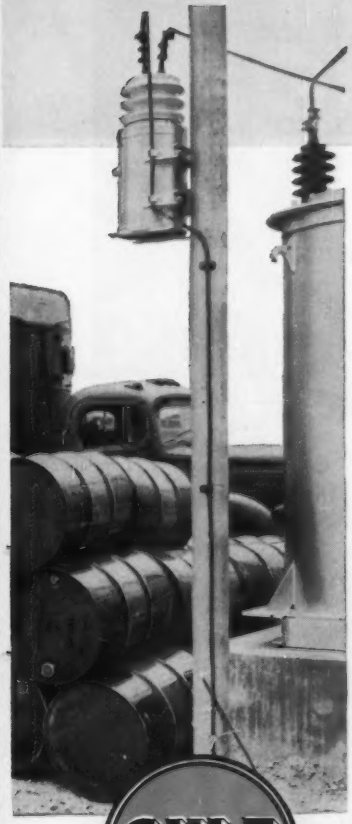


THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Past performance proved it best...

GULFCREST OIL

selected to lubricate another big turbine at Florida Power & Light Company



When the Florida Power & Light Company recently installed the new 150,000 kilowatt General Electric turbine in its ultra-modern Cutler Plant, the choice of a lubricant was no problem. The outstanding past performance of Gulfcrest in the four other units in the plant made it a natural selection.

Gulfcrest Oil has a background of superior performance in other Florida Power & Light Company plants, and in scores of other prominent utilities throughout Gulf's marketing territory. Here's why:

Gulfcrest Oil is super-refined by Gulf's exclusive Alchlor Process, which removes the unstable hydrocarbons that remain after normal refining. This discarded portion, if allowed to remain in a turbine oil, accelerates oxidation, increases neutralization number, forms sludge and harmful acids.

So to insure safe, long-lasting protection for your turbines, specify Gulfcrest—the world's finest turbine oil.

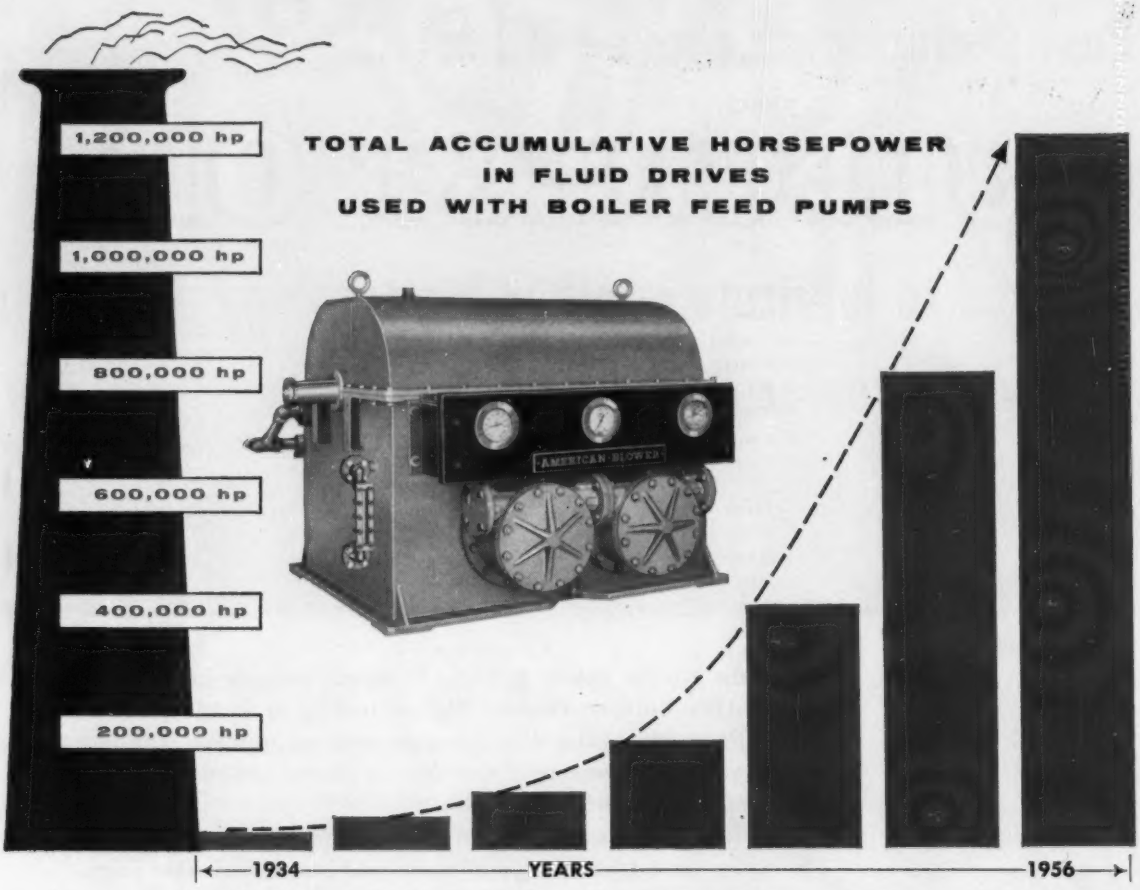
Call a Gulf Sales Engineer today and have him recommend the proper grade of Gulfcrest Oil to meet the specific requirements of your turbines. Consult the telephone directory for the number of your nearest Gulf office.

GULF OIL CORPORATION • GULF REFINING COMPANY
1822 Gulf Building, Pittsburgh 30, Pa.

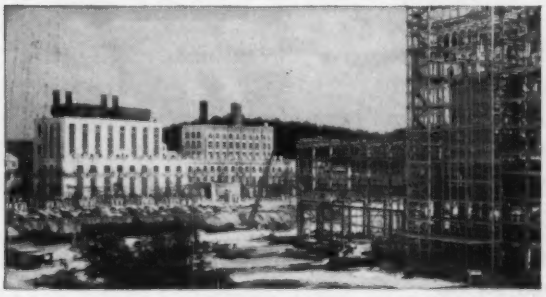
GULF

AMERICAN BLOWER REPORTS ON PROGRESS IN POWER:

The big swing is to Gýrol® Fluid



Accelerated industry-wide acceptance. Beginning in the late 1930's, demands for higher pump pressures resulted in the high-speed boiler feed pump. Consulting and utility engineers turned to Fluid Drive because of power savings from adjustable-speed operation. As a result, new quick-response, close-control Fluid Drives were developed specifically for feed-pump service. Rapid acceptance is shown on graph above. By 1957 there will be in operation in the U.S. close to 1,200,000 hp on feed pumps employing Gýrol Fluid Drives.



In the past ten years, about 250 new generating units (total capacity: 25 million kw) have employed Fluid Drive on the feedwater pumps. This number will jump sharply. For, present U.S. capacity of 100 million kw is expected to increase by 275% within 25 years.

TODAY, Gýrol Fluid Drives save power in plants using conventional fuels, and tomorrow will figure prominently in atomic-powered systems. Stepless speed control of Fluid Drives also saves power on mechanical draft fans; simplifies motors and starting.

Drive for feed pump control!

Here's how power plants of all sizes are using American Blower Gýrol Fluid Drive to prolong equipment life, reduce pressure, save power!

To make more net generating capacity available to consumer lines, more and more power plants of all sizes are turning to Gýrol Fluid Drive to transmit power from the prime mover to the pump.

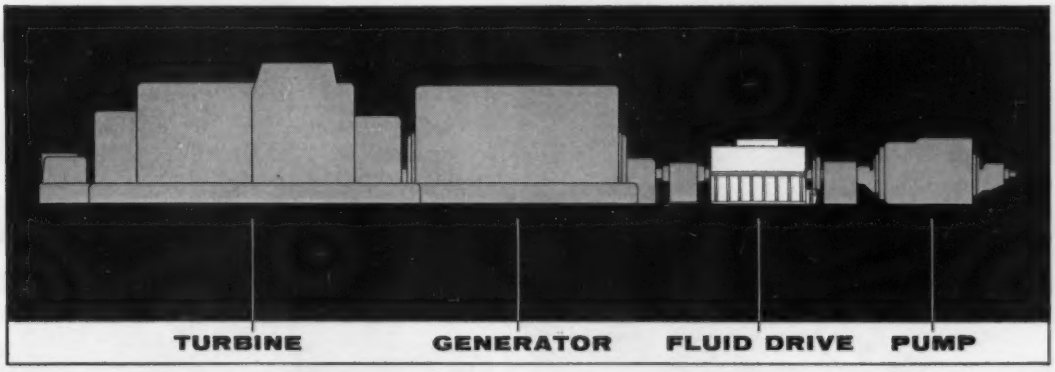
For, of all power-plant auxiliaries, the boiler feed pump and its prime mover consume the greatest single segment of invested power: an average 2.5%. And, with higher steam pressures and temperatures, estimates of 4% to 6% are being discussed for the immediate future—indicating the necessity for power-saving adjustable-speed pump control through the use of Fluid Drive.

The reason for the big swing to Gýrol Fluid Drive lies in the inherent advantages it offers. The use of Gýrol Fluid Drive results in a substantial savings in power, since on present-day, modern high-pressure boiler installations it permits reduction in pressure by use of the Gýrol Fluid Drive's adjustable-speed feature. This reduction in pressure often amounts to 500 lbs. or more.

Through the use of Fluid Drive, the boiler feed pump need only be driven at speed necessary to overcome system friction and boiler pressure. This results in lower pump operating speeds; lower duty on piping, high-pressure heaters, and valves—reducing maintenance and extending equipment life.

In the power-plant industry, Fluid Drive is renowned for its flexibility of control. The narrow range of speed over which a boiler feed pump must operate requires fine increments of speed adjustment, coupled with the need for quick response. The stepless, infinitely adjustable speed control of Gýrol Fluid Drive, together with its rapid response, more than meets this requirement. The Gýrol Fluid Drive has been engineered and designed to be conveniently linked to standard boiler feed water automatic control systems.

In your plans for power expansion, it will pay you to talk to an American Blower engineer. His knowledge of the application of Gýrol Fluid Drives, and American Blower's many other power-plant products, can prove invaluable to you. Just contact your nearest branch office, or write to us direct. American Blower Corporation, Detroit 32, Michigan. In Canada: Canadian Sirocco Company, Ltd., Windsor, Ontario.

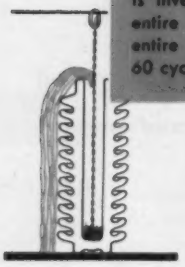


THINGS TO COME. World's largest boiler feed pump—now being built for Consolidated Edison Co. of New York, Inc.—employs a new concept of drive: the main generator steam turbine. Twice as large as any feed pump now in existence, pump is rated at 12,000 hp, with power transmitted through an American Blower Type VS, Class 6 Gýrol Fluid Drive. For full details on American Blower equipment —Fluid Drives, Mechanical Draft Fans, Fly Ash Precipitators, Dust Collectors, Heavy Duty Steam Coils—contact our nearest branch.

AMERICAN BLOWER

Division of American-Standard

100% ELECTRICAL TESTING • Soundness of head (where such a ceramic piece is most likely to be cracked) is assured by flashover test of every piece. Before plugging or assembly, porcelain body is inverted, a chain dropped the entire depth of the hole, and the entire unit subjected to a 3-minute 60 cycle flashover.

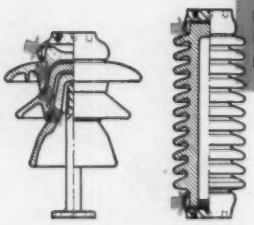


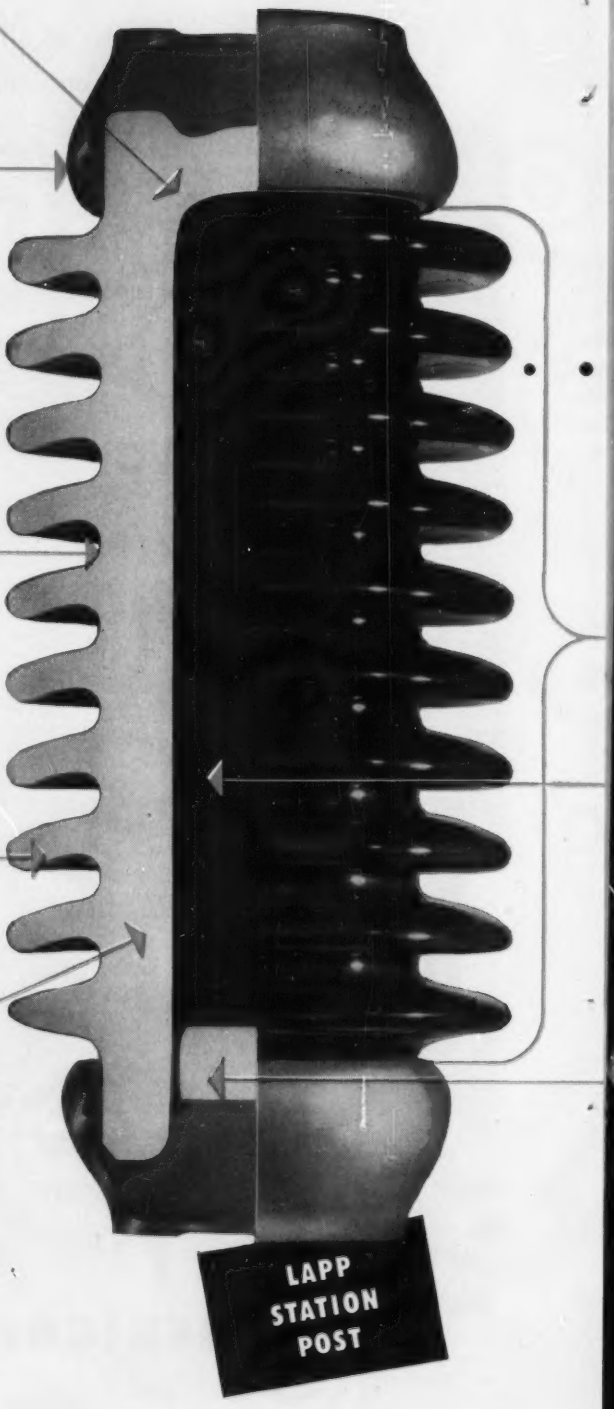
HARDWARE EXTERNALLY ATTACHED • Bases and caps are cemented ON. Porcelain is loaded only in large-area low-intensity compression grip; this eliminates the cause of insulator cracking.

UNIFORM LEAKAGE PATH • Leakage distance secured through multiple short petticoats—*Lapp fog-type design*. Flanges are spaced for natural cleaning action of wind and rain—avoid concentrated hot-spots where local stress can precipitate flashover. This is also the ideal surface for horizontal mounting of insulators.

SHORT STURDY PETTICOATS • Protect body from impact or flashover. Will withstand much more severe attack than required to crack shell-type units, yet will finally break off clean and leave body undamaged.

RIGID UNDER DEFLECTION • One piece porcelain body. No nested porcelain parts, no internal pins, studs or inserts—no internal forces to load porcelain in tension.





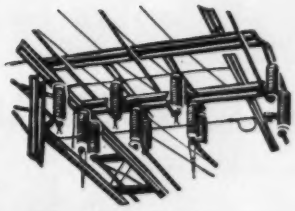
The service record on switch and bus insulators on any major system will show the superiority of Lapp Station Post insulators. Since 1931, these units have been handling dirt conditions, lightning flashover, mechanical shock and loading—with fewer outages, and at lower maintenance and replacement cost, than any other type of station insulator. One reason, of course, is the basic superiority of the design—the Lapp conception of giving mechanical as well as electrical responsibility to a column of porcelain. The other reason is that ***Lapp knows how to make 'em***—how to take advantage of the special strengths of porcelain and avoid its weaknesses. The result is the Lapp Station Post; it will improve service and save money on *your* system. Lapp Insulator Co., Inc., Le Roy, New York.

. . . . THE INSIDE STORY

of Station Post reliability

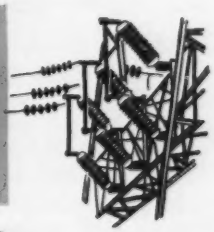
"STRAIGHT-LINE" FLASHOVER • Live terminals are separated by full length of insulator; flashover goes *outside* the unit. Loss of one or more petticoats does not reduce flashover distance.

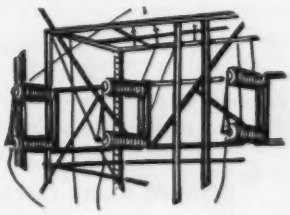
INSIDE GLAZED • All Lapp Post porcelains are glazed inside and outside —a Lapp extra-quality feature that makes for added cleanliness and more critical visual inspection.



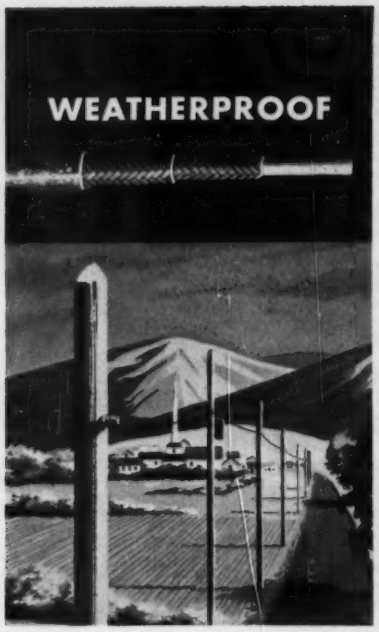
PERMANENTLY PLUGGED PORCELAIN • *After thorough electrical testing,* porcelain body is plugged with porcelain and natural rubber—a Lapp design that has stood the service test of 20 years. This assures a permanently clean, dry hole; avoids internal conductive contamination.

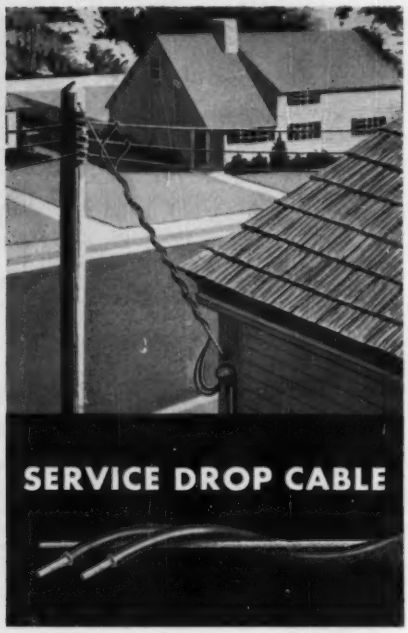
SAME STRENGTH INVERTED • Mount 'em upright, obliquely, horizontally, or inverted—mechanical and electrical characteristics give a safe margin of operating security.





Lapp

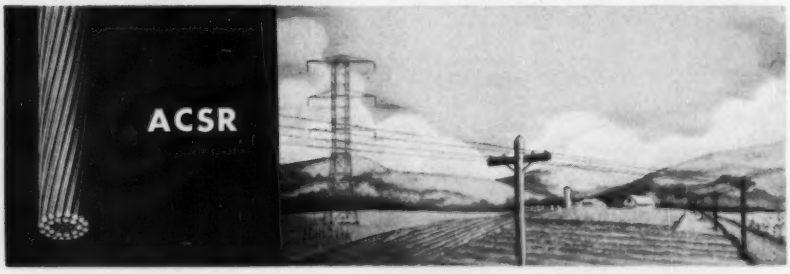




GENERAL CABLE

ALECTRAL

FOR ALL ALUMINUM CONDUCTOR REQUIREMENTS



Built into all ALECTRAL products are 75 years of General Cable's engineering and manufacturing experience. In this record are more than 25 years of successful performance of *insulated* aluminum conductors marketed as ALECTRAL. Available in ALL-ALUMINUM, ACSR, WEATHERPROOF and with RUBBER and THERMOPLASTIC insulations. A sound and economical investment for all voltage ranges.

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Offices and Distribution Centers Coast-to-Coast

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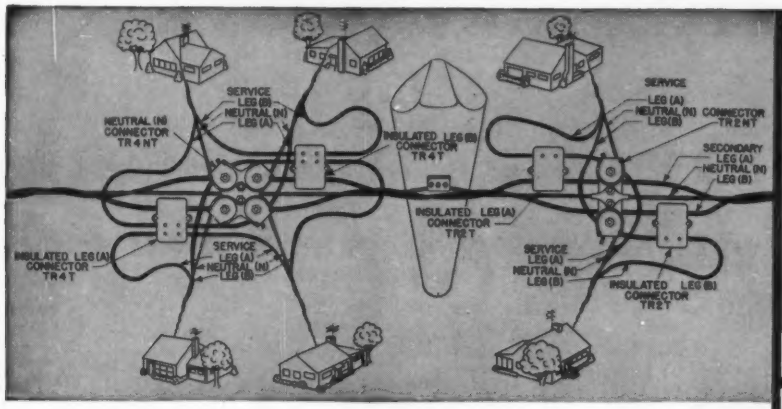
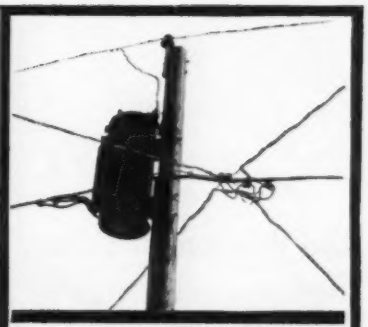

SERVICE LEG (B) NEUTRAL (N) LEG (A)
NEUTRAL (N) CONNECTOR TR4NT
INSULATED LEG (B) CONNECTOR TR4T
SERVICE LEG (A) NEUTRAL (N) LEG (B)
INSULATED LEG (A) CONNECTOR TR4T
INSULATED LEG (A) CONNECTOR TR2T
SERVICE LEG (A) NEUTRAL (N) CONNECTOR TR2NT
SECONDARY LEG (A) NEUTRAL (N) LEG (B)
SERVICE LEG (A) NEUTRAL (N) LEG (B)
INSULATED LEG (B) CONNECTOR TR2T



A complete 4 service TRIPL-X-TAP unit with type GTC connectors used as secondary feeder taps. †

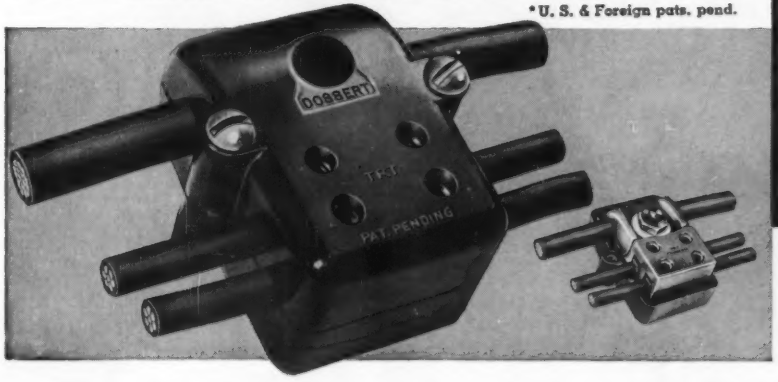
Dossert leads the industry again with the NEW

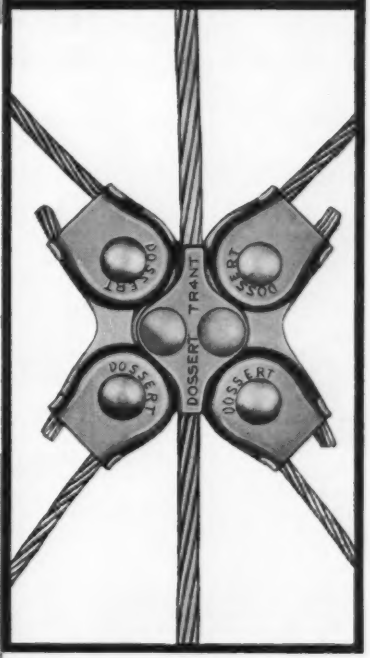
TRIPL-X-TAP*

3-UNIT CONNECTOR

FOR SELF-SUPPORTING SECONDARY AND SERVICE DROP CABLE

*U. S. & Foreign pats. pend.





NEUTRAL CONNECTOR

INSULATED CONNECTOR

Forget about hand-taping . . . about complicated residential hook-ups!

Dossert's new TRIPL-X-TAP 3-Unit Connector—for conductors of copper or aluminum or both—saves labor and installation costs . . . insures the most dependable connections possible.

TRIPL-X-TAP or its components can also be used on open wire systems.

Two Insulated Connectors plus a Neutral Connector comprise the compact, low cost TRIPL-X-TAP "package". No need to remove insulating cover for subsequent connects or disconnects. No secondary spool racks or costly extra hardware. TRIPL-X-TAP installations insure positive electrical joints and through use of supporting neutrals guarantee mechanical permanence. The insulated connector housing is made of high strength, high impact Bakelite composition, affording better insulation and protection.

† Courtesy of Long Island Lighting Co.

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Write for details and prices today.

DOSSERT MANUFACTURING CORP.

249 Huron Street, Brooklyn 22, N. Y.

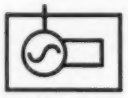
Exclusive Canadian Distributor: W. S. Gerrie & Assoc., Ltd.
4158 Dundas St., West Toronto 18, Ont., Canada

For emergencies and

the Wisconsin Power and Light Company brings a new power source right to the point of need.

This 500-kw. Electro-Mobile highway unit helps provide uninterrupted service to its customers while line and substation work is being performed. Outages are thus minimized and work can be done more safely in less time.

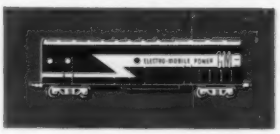
The unit also is available to handle major emergency situations which might arise—with all the speed and mobility of highway transportation.

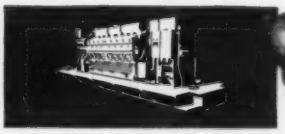


Rail car, truck trailer and portable units—350 to 1,000 kw.

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS · La Grange, Illinois

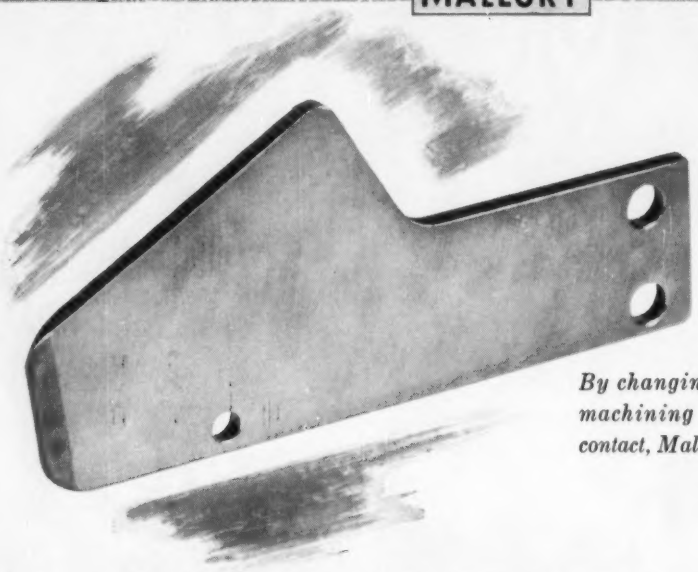




Sold and serviced directly through a manufacturer's organization. Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis and San Francisco. In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

planned outages

MALLORY



By changing materials, simplifying machining on this voltage regulator contact, Mallory engineers cut costs 25%.

Value Analysis by Mallory Saves Money on Contacts

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design . . .** for your purchasing, production and product needs.
3. **The most economical backing material . . .** from a group of Mallory alloys developed for this use.
4. **The most economical backing member design** in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

BETTER not take electrical contacts for granted. There's much more to contact design than meets the eye. Often Mallory engineers can, through a detailed analysis of requirements, recommend changes that amount to real savings.

The contact shown here, for a substation transformer voltage regulator, illustrates how deeply Mallory engineering penetrates into contact design. First step after scrutinizing all aspects of the application, was to change the material to Mallory ELKALOY® A. *This change gave a more economical alloy to work with . . . at no sacrifice of performance for the intended use.* Then, Mallory specialists recommended simplifications in manufacturing. Instead of a double disc finishing operation, they used a rolled-finish product . . . with less waste, less cost. Also eliminated as unnecessary to the desired service were three complete operations: sanding of the entire edge of the piece, and counterboring of holes for hold-down bolts and buffing of the chamfered end.

The contact is now being manufactured under simplified specifications, free of unnecessary "frills"—and gives equal performance *at 25% less cost!*

This is the kind of thorough, cost-conscious engineering that Mallory can apply to your own electrical contact designs. Our extensive experience in contact alloys, contact design and contact assembly engineering is ready to serve you. Write or call Mallory for a consultation.

Expect more . . . get more from

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals • Welding Materials

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

. . . powerful protection!

More and more major refineries and pipe line companies are using SIMPLEX CATHODIC PROTECTION CABLES to equalize voltage potentials between metallic structures and the earth. Polyethylene-or Anhydrex-insulated, these cables have good resistance to water absorption, excellent electrical properties and high resistance to deterioration. They are not affected by the usual acid or alkali conditions found in the earth.

SIMPLEX WIRE & CABLE CO.
79 Sidney Street
Cambridge 39, Mass.

Westinghouse fluorescent luminaires' exclusive features speed installation and maintenance

Look what's new in Cleveland! A great white way of fluorescent light by Westinghouse 4FSL-72 street lighting luminaires. The change from the old system to the new was made in record time because Westinghouse units are designed for quick installation and simple maintenance. The importance of these advantages can be measured in real savings—savings in labor cost during installation and for the maintenance life of your street lighting system.

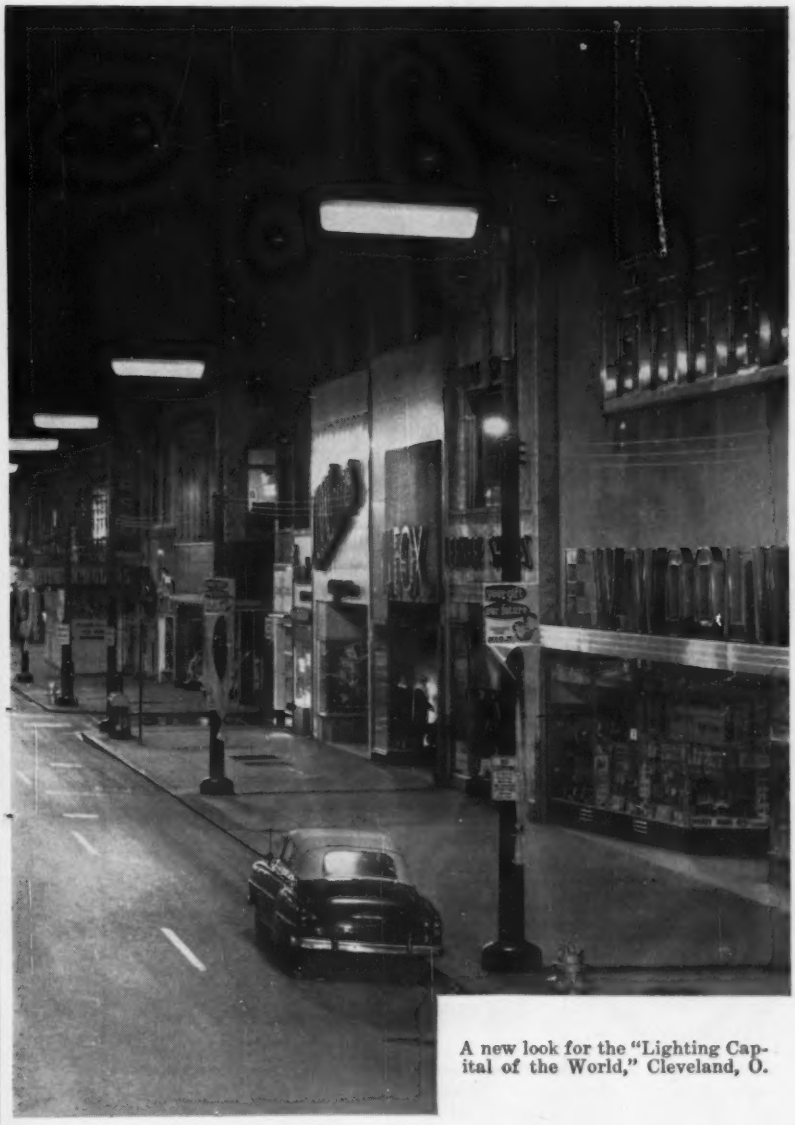
If you are planning a fluorescent street lighting program, examine these important features, and you will agree that the Westinghouse 4FSL-72 fluorescent luminaire is built for a lifetime of efficient, economical operation.

More information? See your nearby Westinghouse representative, or write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio.

J-04390

WATCH WESTINGHOUSE

where **BIG** *things are happening for* **YOU**



A new look for the "Lighting Capital of the World," Cleveland, O.

Attaching luminaire to pole . . . is done by tightening four bolts on the heavy-duty mounting bracket. 4FSL-72 may be mounted horizontally or at a 15°-30° angle for wider light distribution.

Connecting wiring . . . three knurled nuts are loosened *without tools*, allowing reflector to hinge down for easy access to ballast and wiring. Wire is brought through watertight bushing; leads are then attached to terminal block.

Closing luminaire after installation . . . cover may be opened or closed from either side by releasing three pressure latches. Cover is clear acrylic plastic which will not discolor with age. Fiber glass housing *never* requires painting.

Introducing "Skimpy Wiring" to your homeowner customers!

More than 15,793,000 readers of the Saturday Evening Post and This Week national magazines will see this dramatic Kennecott ad featuring "Skimpy Wiring"—Dead End Kid of the electrical business!

It's another nation-wide advertisement in the Kennecott campaign for better home wiring with copper—a drive that *helps you increase your sales of power!*

Let Kennecott help you with your own local better wiring campaign, too!

SEND FOR FREE PROMOTION MATERIAL

Send today for free reprints and poster-sized blow-ups of *Kennecott's* full-page national advertisements. Get free copies of the educational booklet, "The ABC of Home Wiring." Ask for complimentary home wiring Wall Chart, mat service folder and list of *at-cost* prices for large-quantity orders of all material available. No cost, no obligation! Just write: Kennecott Copper Corp., Dept. W66, 161 East 42nd St., New York 17, N. Y.

MEET SKIMPY WIRING

The Electrical Delinquent found in 35,000,000 homes!

Look at that tangle of plugs and sockets! Note the frayed, weak-looking wiring! That's him, all right – Skimpy Wiring – the villain responsible for the electrical woes of homeowners all over the nation.

Have *you* a toaster that heats slowly? Does *your* TV set twitch when other appliances go on? Do *your* fuses blow or circuit breakers trip too often? If so, beware . . . you are a victim of Skimpy Wiring!

Weak, worn-out home wiring cannot possibly deliver full power to your appliances. It wastes electricity, can cause appliance failure, may even be a source of fire!

If you see signs of Skimpy Wiring in your own home, call an electrical contractor or consult your local power company. Learn how easily you can have safe, *adequate copper* wiring installed to make your home more *electrically livable!*

• • •

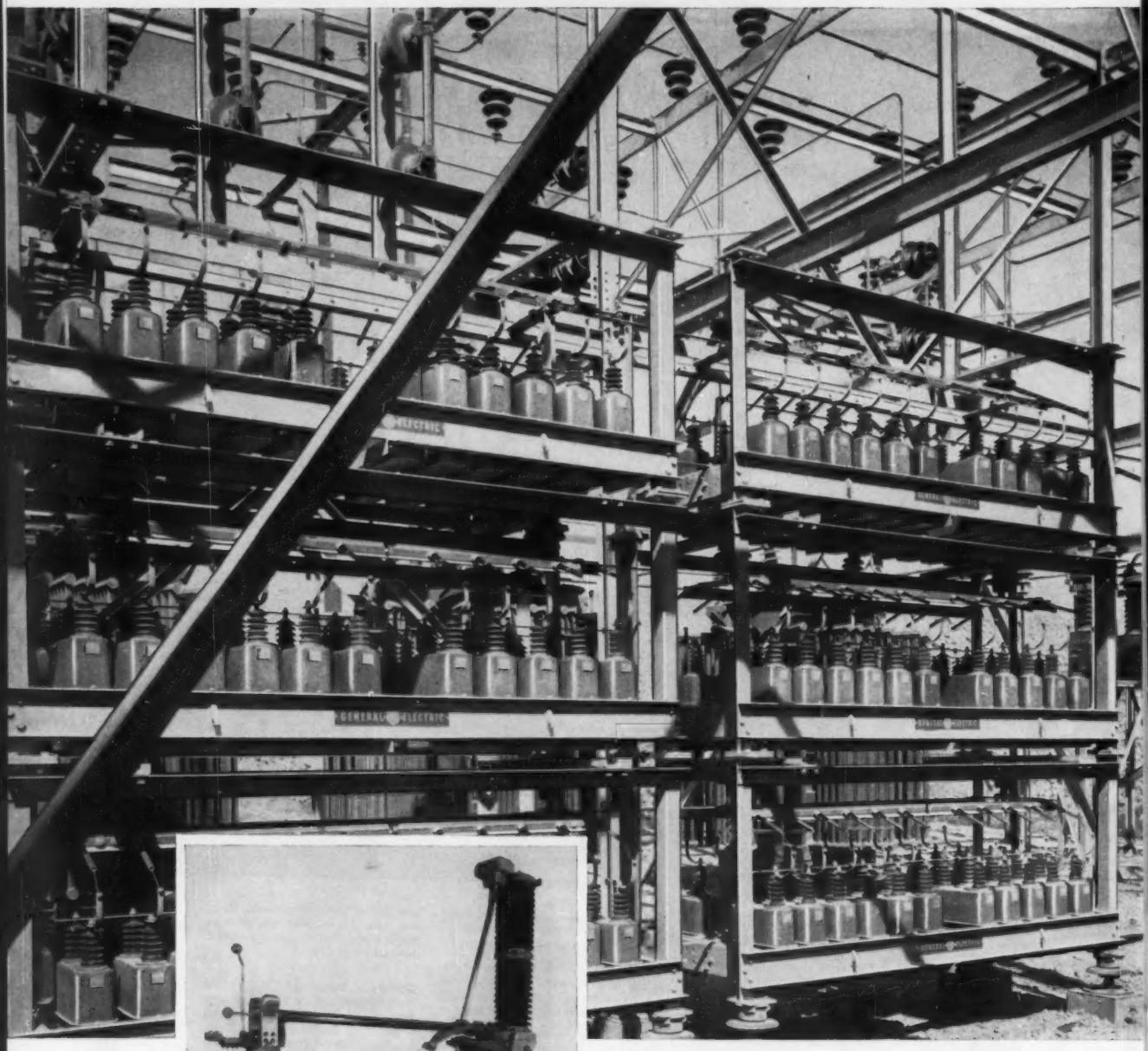
Get FREE Booklet! "The ABC of Home Wiring" explains facts about your electricity, how you can make it serve you better. Write Kennecott Copper Corp., Dpt.W-66, Box 238, New York 46, N. Y.

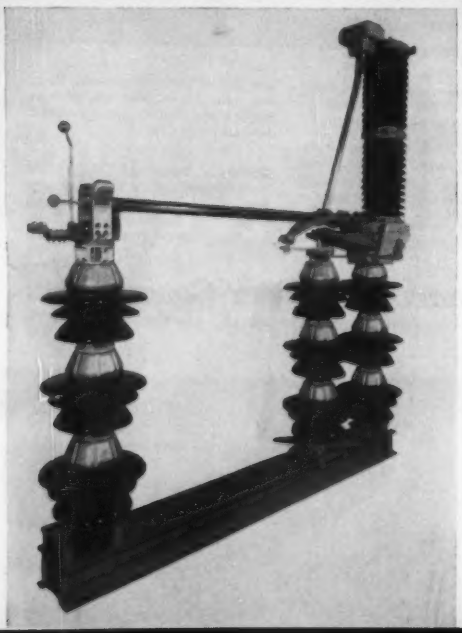
Kennecott Copper Corporation

Fabricating Subsidiaries: CHASE BRASS & COPPER CO. • KENNECOTT WIRE & CABLE CO.

Now available from General Electric . . .

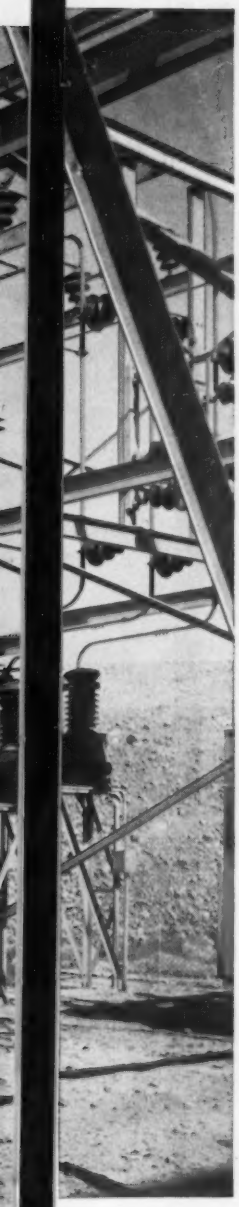
HIGH VOLTAGE CAPACITORS





THE SCHWAGER-WOOD TYPE IV vacuum interrupter switch consists of a conventional airbreak switch on the end of which is mounted the vacuum interrupter device. This revolutionary device has undergone exhaustive tests and has been found to be ideal for switching high voltage capacitor banks. Because of the significant dollar savings made possible in both original cost and subsequent maintenance, General Electric is adopting the vacuum switch for use with its stack-rack capacitor banks where it is technically feasible and desirable for the customer. General Electric Company, Schenectady 5, N. Y.

WITH VACUUM SWITCHING



New Schwager-Wood Vacuum Switch cuts costs, eases maintenance in capacitor bank switching.

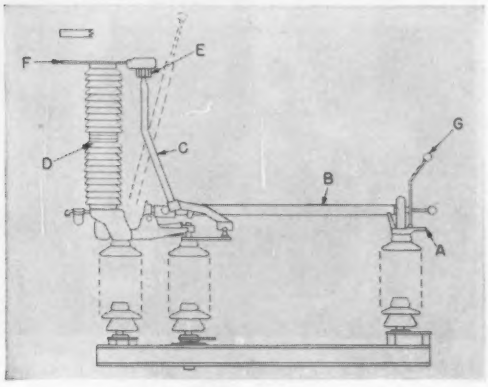
General Electric now offers new switching economy with the Schwager-Wood Type IV Vacuum Switch for high-voltage capacitor banks. The new switches, designed for switching service only, are available for single bank switching in ratings from 7.5 to 69 kv ungrounded at 3000 to 10,000 kva, and from 7.5 to 115-kv grounded at 3000 to 20,000 kva.

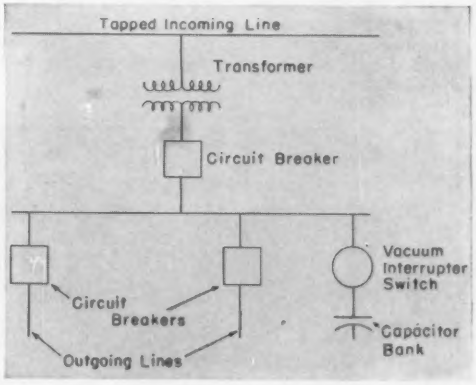
Up to 60% switching cost savings are now possible over many currently used high voltage capacitor switching devices. The new switch requires less expensive maintenance as a minimum of 2500 interruptions are now possible before regular service is required. The purchase cost savings over conventional breakers are especially significant at 23 kv and above.

Extensive tests of the vacuum interrupters have shown their ability to drop line. Two vacuum switches in series successfully dropped 100 miles of 115-kv transmission line. Four vacuum switches in series successfully dropped 150 miles of 230-kv line.

The new switch can be installed in remote areas without need for replacement of the dielectric or arc quenching medium.

Your General Electric Apparatus Sales Engineer can furnish you with complete data and buying information on high voltage capacitor banks with vacuum switching. He'll be glad to tell you how the new vacuum switch may be significant to your specific needs.





IN THE CLOSED POSITION current flows from point A, through bar B, up to through bar C to point E and to line connection F. On opening, bar C rotates about the axis of bar B. Current then flows through the closed vacuum switches located in the porcelain column D. Further operation of the opening mechanism separates the contacts of the vacuum switches interrupting the load current. Bar B is then raised to the vertical position indicated, providing visible air disconnection of the circuit.

On closing, the vacuum switches are first closed, followed by lowering of bar B to the horizontal position initiating load current when bar B contacts arcing horn G. Bar C then rotates to the vertical position shunting the vacuum switches.

THE VACUUM SWITCH PROVIDES an ideal load break mechanism for switching large, high voltage capacitor banks. When available fault protection can be used in the rare event of a major bank fault, the vacuum switch may offer appreciable savings in capacitor switching costs. The inherent high withstand strength of a high vacuum offers ideal characteristics for a load-break capacitor switch when used to switch a capacitor bank which experiences only moderate inrush currents. The vacuum switch does not have a maximum inrush current rating, and the switching of one capacitor bank against another is not recommended at this time. It is anticipated that work under way will result in the determination of a suitable inrush current rating.

441-35

Progress Is Our Most Important Product

GENERAL ELECTRIC

Most capacity per pound of weight with the

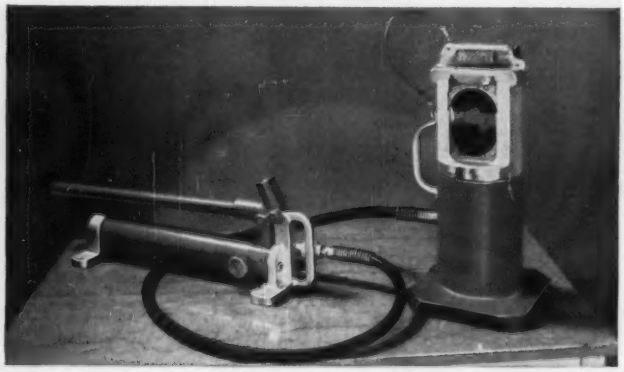
NEW ALCOA 60-TON

PORTABILITY is a main feature. Man on right carries compressor and stand; man in center has gasoline-engine pump, 60 pounds; man on left carries connecting hose and accessories.

FAST ACTING compressor made three complete compression joints on 3/0 ACSR, including cutting conductor and trimming aluminum strands, in 23 minutes.

TWO-STAGE HAND PUMP increases speed of compression. Unit pumps fast until die pressure builds up. Manual release valve plus spring-loaded piston gives quick retraction.

HEAD LOCKS in position, can't fall out, unlocks at press of finger. Dies also lock in position, release at push of button.



COMPRESSOR rests in simple stand for ground work. Accessible handles on pump and compressor simplify operating and carrying. Spring guards protect hose.

COMPRESSOR

- **PORTABLE**
- **FAST ACTION**
- **LARGE RANGE OF CONDUCTOR SIZES**

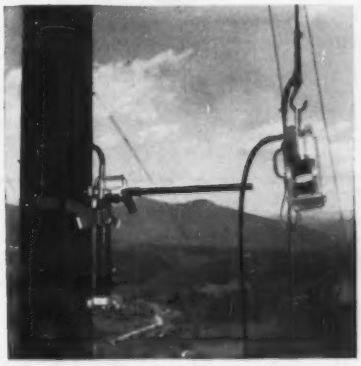
A thrust of 60 tons in a tool weighing only 42 pounds is now possible with the new Alcoa® 60A Compressor. Designed to apply compression fittings on ACSR or stranded aluminum conductors up to two inches in diameter, the new compressor offers more versatility than any other tool available today. Hand- or power-operated pumps are available for the compressor. For more information on the model 60A compressor, contact your Alcoa representative or write Aluminum Company of America, 2306-T Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM

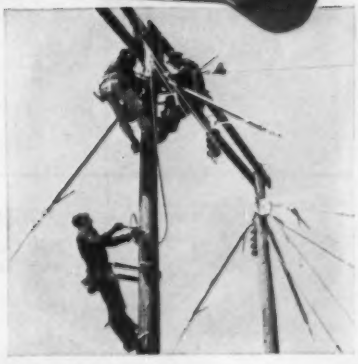
ALUMINUM COMPANY OF AMERICA

THE ALCOA HOUR—Television's Finest Live Drama, Alternate Sunday Evenings



HOISTING BAIL for hand line is a permanent part of compressor unit. Flexible steel cable prevents accidental dropping of head when placing compressor over fitting.

ONE MAN handles compressor, other operates gasoline-engine pump. Power pumps have been used 75 ft from the compressor.

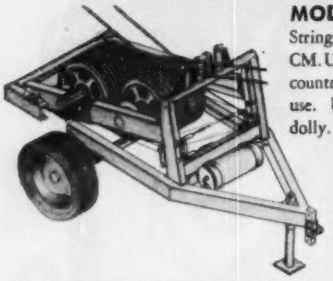


SIMPLICITY with light weight is chief advantage of new Alcoa 60A Compressor. Pump and compressor operate in any position; use SAE 10 motor oil.

Partial showing of the now ***COMPLETE*** line of...

PENGO TENSION WIRE STRINGING EQUIPMENT

Manufactured By **PETERSEN ENGINEERING CO., *Santa Clara, Calif.***

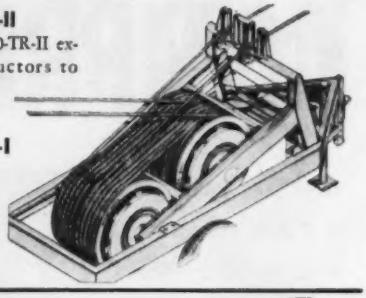


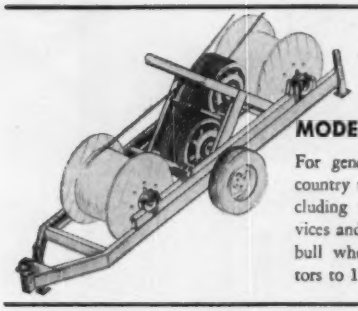
MODEL 5000-TR-II
Strings two conductors to 556,300 CM. Used primarily for very rough country work; also for general use. Use separate reel-carrying dolly.

MODEL 5000-TR-I
Similar except strings one conductor.

MODEL 6000-TR-II
Similar to Model 5000-TR-II except larger. Conductors to 1,272,000 CM.

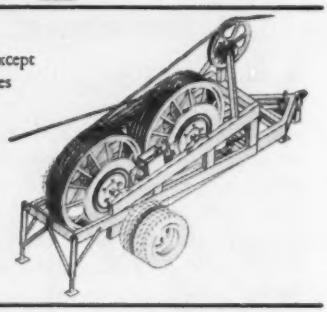
MODEL 6000-TR-I
Similar except for one conductor.

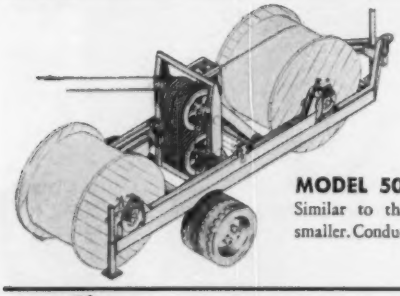




MODEL 6000-WS-TR
For general and medium rough country use. A complete unit including trailer, reel-carrying devices and its own double pair of bull wheels. Conductors to 1,272,000 CM.

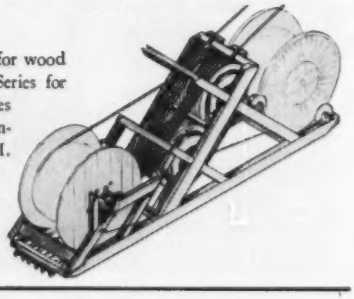
MODEL 7000-TR-I
Similar to model 6000-TR-I except larger. Conductors to 2 inches diameter.

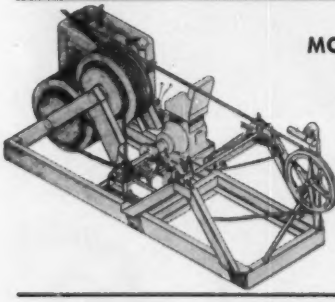




MODEL 5000-WS-TR
Similar to the 6000-WS-TR but smaller. Conductors to 556,300 CM.

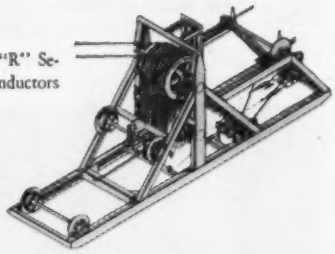
MODEL 6000-W
Available in "S" Series for wood or steel reels, in "R" Series for steel reels, or "SR" Series for trailer mounting. Conductors to 1,272,000 CM.

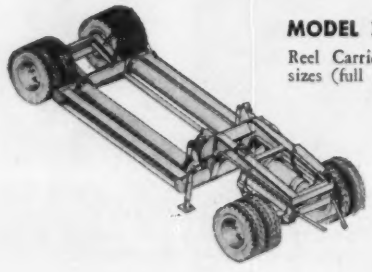




MODEL 6500
Bull Wheel Cable Puller. Available in "R" Series for steel reels, "S" Series for wood reels. Conductors to 1,272,000 CM. Also available in "LWR" Model for extra-large steel reels. Model 5500 similar (smaller).

MODEL 5000-SR
Available in "S" Series, "R" Series, or "SR" Series. Conductors to 556,300 CM.





MODEL 7500
Reel Carrier. Takes the largest sizes (full range) of steel reels. Loads and unloads with one man. No auxiliary equipment needed except the truck that pulls it. For use with any one of the tensioning machines shown on this page.

ADDITIONAL MODELS NOT SHOWN

Tension Reel Trailers

MODELS 2, 3, and 4, Two-Wheel Straddle Dollies not shown. For use with any one of the tensioning machines shown on these pages.

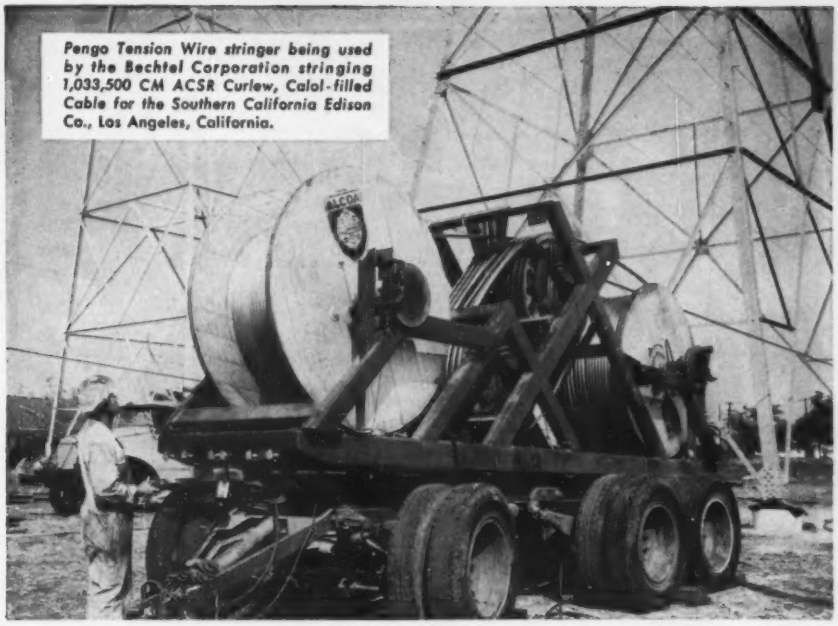
Tension Stringers

MODELS 6000-SK-I and 6000-SK-II For one or two conductors to 1,272,000 CM. Skid mounted for installation on owner's equipment.

MODELS 5000-SK-I and 5000-SK-II Skid mounted for installing on owner's equipment. For stringing one or two conductors to 556,300 CM.

MODEL 5000-WS-III Strings three conductors to 556,300 CM. For mounting on low-bed or full trailer.

MODEL 6000-WS-III Strings three conductors to 1,272,000 CM. For mounting on low-bed or full trailer.



Pengo Tension Wire stringer being used by the Bechtel Corporation stringing 1,033,500 CM ACSR Curlew, Calol-filled Cable for the Southern California Edison Co., Los Angeles, California.

The latest method of stringing conductors

- ***Safest, most economical for transmission, distribution and even secondary lines.***
- ***Its greatest savings are effected when stringing over and through energized circuits... by far the safest, too!***

Operation of the PENGO Tension Wire Stringer is almost unbelievably smooth. Because the tensioning is done on the Neoprene-Lined Bullwheels rather than on reels, conductor damage from the reels has been eliminated entirely. Due to the Neoprene lining of the Bullwheels, it is possible to use a full range of wire sizes to maximum groove capacity, which, in the case of the Model 6000-WS shown in picture, is Pheasant or 1⅜" diameter.

SMOOTH, POSITIVE CONTROL OF CONDUCTOR TENSION can be maintained at all times regardless of model or size of PENGO Tension Wire Stringer used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

In addition to the model shown in the picture, all series are available in low-slung trailer mounts for mountain work with separate easy-loading reel trailers.

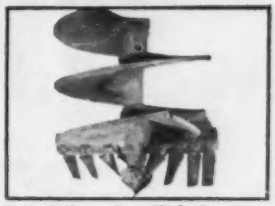
List your requirements and send for descriptive literature and prices.

PETERSEN ENGINEERING CO.
Santa Clara, California Dept. 4
Please send me more information on the new Pengo Tension Wire Stringer.
Name_____
Firm_____
Address_____
City_____ State_____

Made by the makers of the World-Famous
PENGO EARTH AUGERS

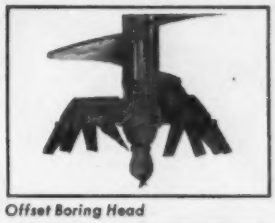
PETERSEN
ENGINEERING COMPANY
Santa Clara, Calif.

Other PENGO Products include:

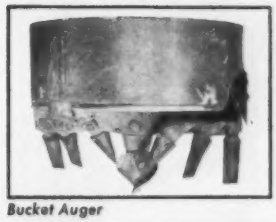


24 inch Heavy Duty Flight Auger

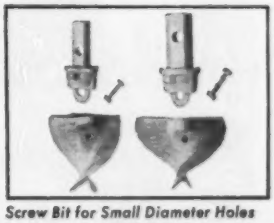
Double-Helix Heavy Duty Auger



Offset Boring Head

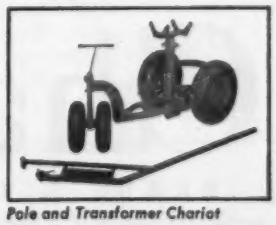


Bucket Auger



Screw Bit for Small Diameter Holes

Pulling Eye



Pole and Transformer Chariot

Where would you get condenser tubes...

...for the longest Steam Condenser in the world?

Jersey Central Power & Light Co. has what is reported to be the world's longest steam condenser in the Raritan River station, Sayreville, N.J. For this huge job, they chose *Chase* 60-foot Cupro-Nickel condenser tubes.

Good reason for this! Years and years of valuable condenser tube experience, coupled with modern, expert research facilities, have made Chase a leader of long standing in this field!

Specialists in the Chase Research and Development Group are constantly testing and experimenting—fighting corrosion problems in the laboratory and in the field.

Shipped from Chase mills in Waterbury, Connecticut and Cleveland, Ohio, literally millions of pounds of Chase Condenser Tubes have passed the toughest test of all—dependable, trouble-free service on the job! Like Jersey Central Power and Light Company, you, too, can add extra years to condenser tube life. *Simply insist on Chase!*

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

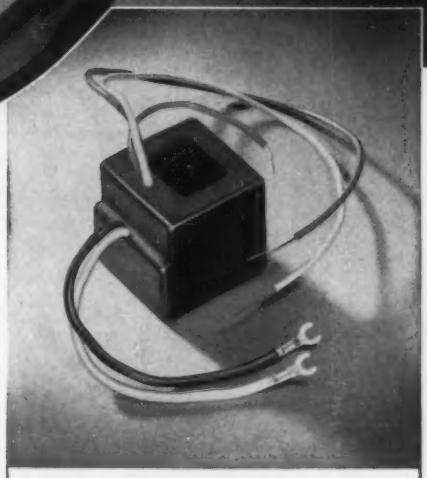
Atlanta	*Chicago	Denver	Indianapolis	Minneapolis	Philadelphia
Baltimore	Cincinnati	Detroit	Kansas City, Mo.	Newark	Pittsburgh
Boston	Cleveland	Grand Rapids	Los Angeles	New Orleans	Providence
Charlotte	Dallas	Houston	Milwaukee	New York	Rochester
	St. Louis	San Francisco	Seattle	Waterbury	

PROVEN ECONOMY BOOSTS USE OF SANGAMO J2T

The high accuracy, low maintenance, and long life of Sangamo J2T singlephase thermal demand-watthour meters set the pace for the greatly increased use of these combination units.

Their fine performance record helped boost total sales of all manufacturers by 16,313 more thermal combinations in 1955 than in 1954.

The J2T is ideally suited for application to singlephase residential and commercial loads. It is supplied with a 24 KW scale to take full advantage of the 100 ampere range of J2 Watthour Meter. It is also available with a 12 KW scale for power companies who measure demands on smaller loads and want indications above ¼ to ⅓ scale.



Better protection from lightning and high voltage surges

The insulation levels of the demand element and the watthour meter element of these combination meters are equally high. The potential transformer coil of the demand element is encapsulated in Sangamo Secolene, a specially developed epoxy resin with extremely high dielectric strength.

Write for more information on these cost-cutting demand meters today.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

BM56-1

Westinghouse
15

A 1956 transformer to help you sweat out heat storms

Here's a new and practical way to drastically reduce future heat-wave casualties. A 20% increase in operating range in the 1956 Westinghouse CSP® transformer permits carrying additional loads during periods of high ambient. This new overload ability has been made available at no sacrifice in service life.

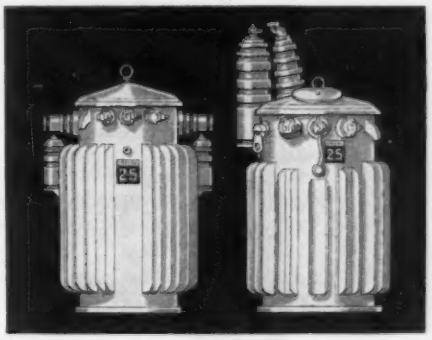
Over and above that, this CSP transformer is equipped to furnish a 15% additional emergency range by using the emergency control.

On the 1956 CSP transformers, the signal light will remain at the ASA level as on previous models. This means you will have extended operating range — or additional time before change-out to a larger rating. Where the signal lights are noted on a planned basis, you have TIME to make an area load check . . . TIME to make change-out on an orderly planned basis . . . TIME to assure customer service continuity with no burn-outs. These additional advantages are available on Westinghouse CSP transformers at no premium in cost.

The Completely Self-Protecting transformers are still provided with the time-proved advantages of (1) 3-point protection against lightning, (2) protection from secondary short circuits or long-time overloads, (3) protection from line lockout by means of an internal protective link.

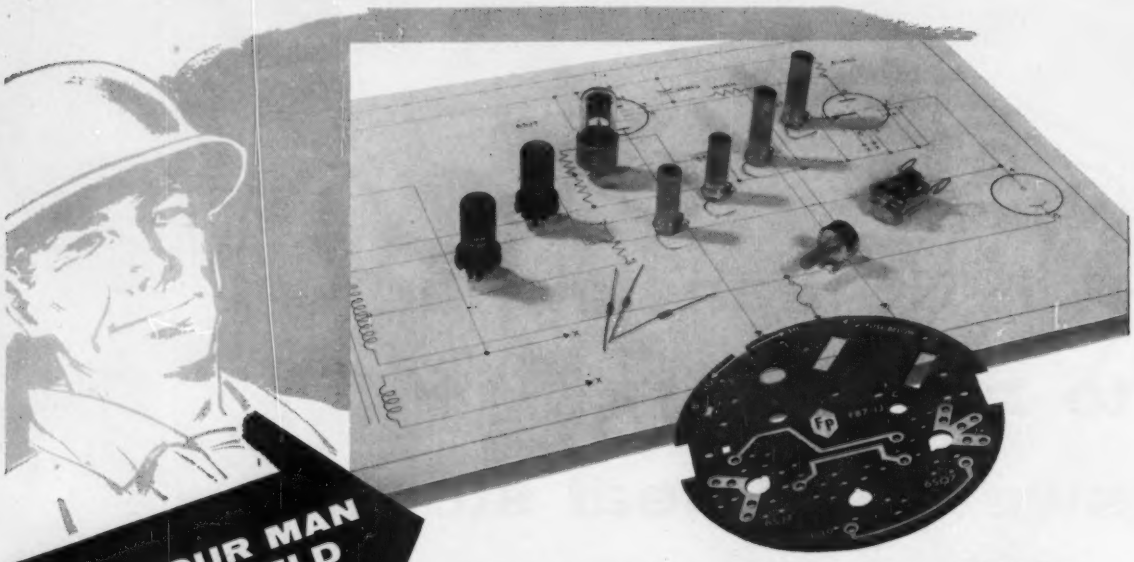
For the complete story on the 1956 CSP transformer with increased breaker trip settings, call your Westinghouse sales engineer today, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70763



WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

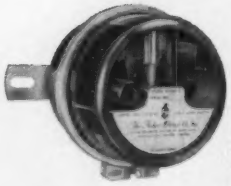


ASK YOUR MAN IN THE FIELD ABOUT THE

component quality

OF FISHER-PIERCE PHOTOELECTRIC LIGHTING CONTROLS

A look inside any Fisher-Pierce photoelectric lighting control immediately reveals a primary reason why they require extremely low maintenance and provide long-run economy: *component quality*. Here are specific examples: two *pre-aged* amplifier tubes, instead of one dual triode, for a guaranteed minimum life of 20,000 hours; *wire wound* potentiometer; *Sigma* sensitive relay for low plate current drain of power tube; *linen-based bakelite* sub-mounting chassis and etched circuitry; *metal encased* paper capacitors (no electrolytics); blue-sensitive 1P39 phototube with non-hygroscopic base. No other photoelectric control provides such consistently high component quality. Combined with this are these four other important features:



DESIGN ADVANTAGES — Can be installed, serviced or removed safely and easily • Wide mounting versatility and orientation after bracket installation.

PROTECTION — From surges and lightning, by linen-based bakelite sub-mounting chassis and proper component spacing Circuit and load fuses, and lightning arrestor • Fail-safe operation.

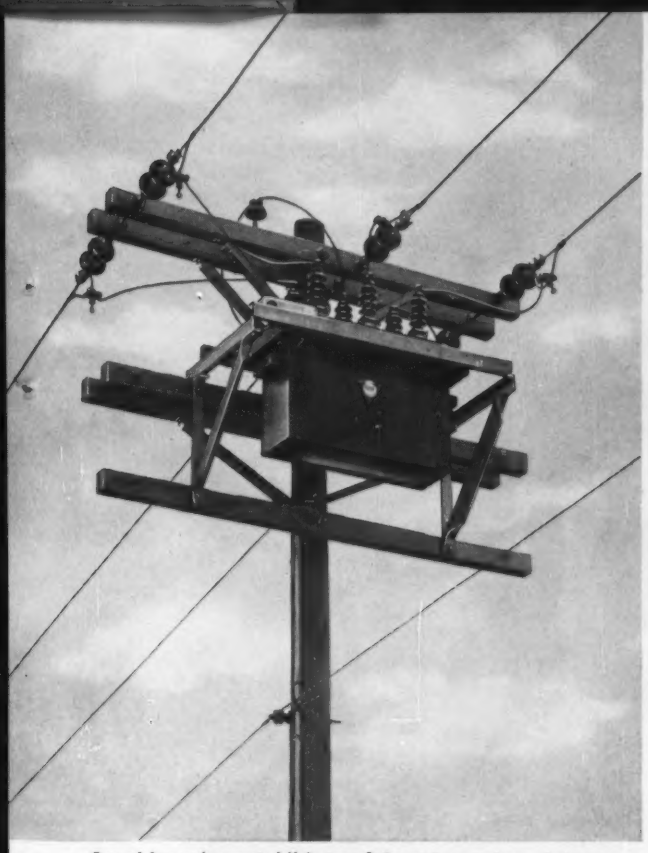
ADAPTABILITY — Three basic series and numerous models for all mounting requirements, operating voltages, load capacities and desired contact arrangements.

DEPENDABILITY — Proven by the thousands of F-P controls used by hundreds of utilities, over the past ten years.

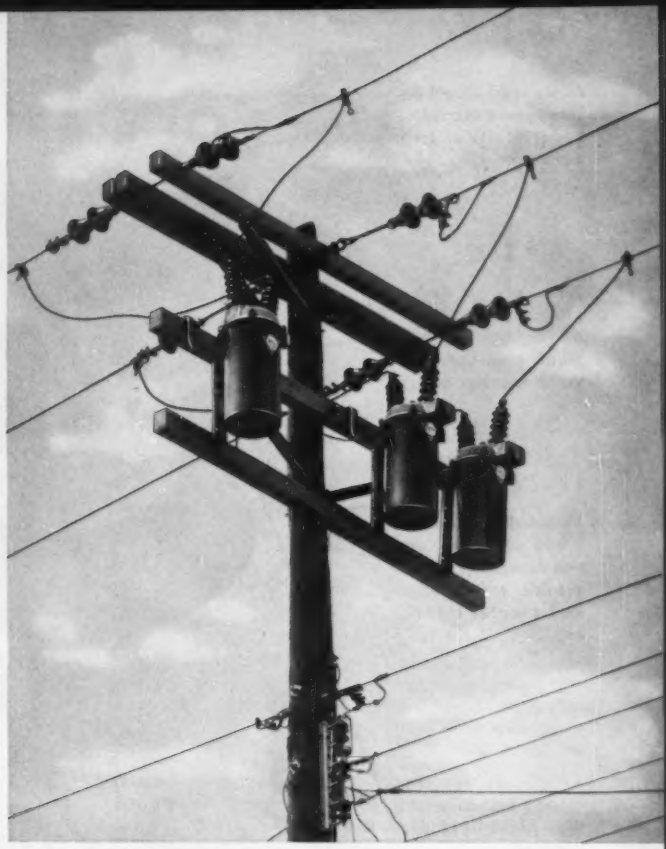
Complete specifications and operating data are contained in informative F-P Bulletins, available on request. Or call the Fisher-Pierce sales representative in your area, for point-by-point proof of F-P superiority.

THE FISHER-PIERCE CO., INC.

82 Pearl Street, So. Braintree, Boston 85, Mass.



One of four pole-mounted Kyle type R three-phase reclosers that were installed in the initial area converted to 13 kv. The type R provides simultaneous 3-phase fault protection and fully coordinates with other types of Kyle sectionalizing equipment and with branch line fuses.



One of 13 Kyle type L single-phase recloser installations in the initial area converted to 13 kv. The installations involved over 2100 customers and protected 155 miles of line. Trees and animals were the primary hazards affecting operation of the distribution feeders.

Utility converts fringe area to 13 kv distribution system . . .

Conversion Plans Include Kyle Reclosers To Provide Transient Fault Protection

By **JAMES A. VARGA**
Field Engineer
Indianapolis Office
Line Material Company

Indianapolis Power & Light Company is accomplishing two objectives at the same time in their plans for converting to a 13 kv distribution system. This company is able to *serve heavier loads* on the existing system by going to a higher voltage. And second, it is providing *better service continuity* by installing L-M Kyle reclosers for completely coordinated transient fault protection.

L-M Kyle reclosers provide the high-speed circuit clearing (2-cycles maximum) required to reduce conductor burndown caused by transient faults. It is possible to clear up to 90% of transient faults and reduce permanent faults with Kyle reclosers.

All L-M Kyle reclosers can be coordinated in series by selection of coil size or sequence. They are completely automatic and self-contained, with operating sequences accurately controlled by the hydraulic timing mechanism.

Single- and Three-Phase Reclosers

The Kyle type L single-phase and type R three-phase reclosers are rugged, power-class reclosers designed for pole mounting or in substations. They offer the widest choice of time current characteristics—fast, retarded, and extra-retarded, with four operations to lockout in any of seven sequences. The ratings range from 25 to 400 amperes, with up to 100,000 kva fault capacity. Almost any supplementary relaying scheme is adaptable to the type R recloser for substation application. These include ground tripping, shunt tripping, shunt lockout, and auxiliary switches for remote-control indication, low-voltage control switching, or metering.

Get the Whole Story on L-M's Kyle Reclosers and Sectionalizers

Ask your L-M Field Engineer for information and bulletins on Kyle apparatus and complete coordination—single- and three-phase—from substation to load. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

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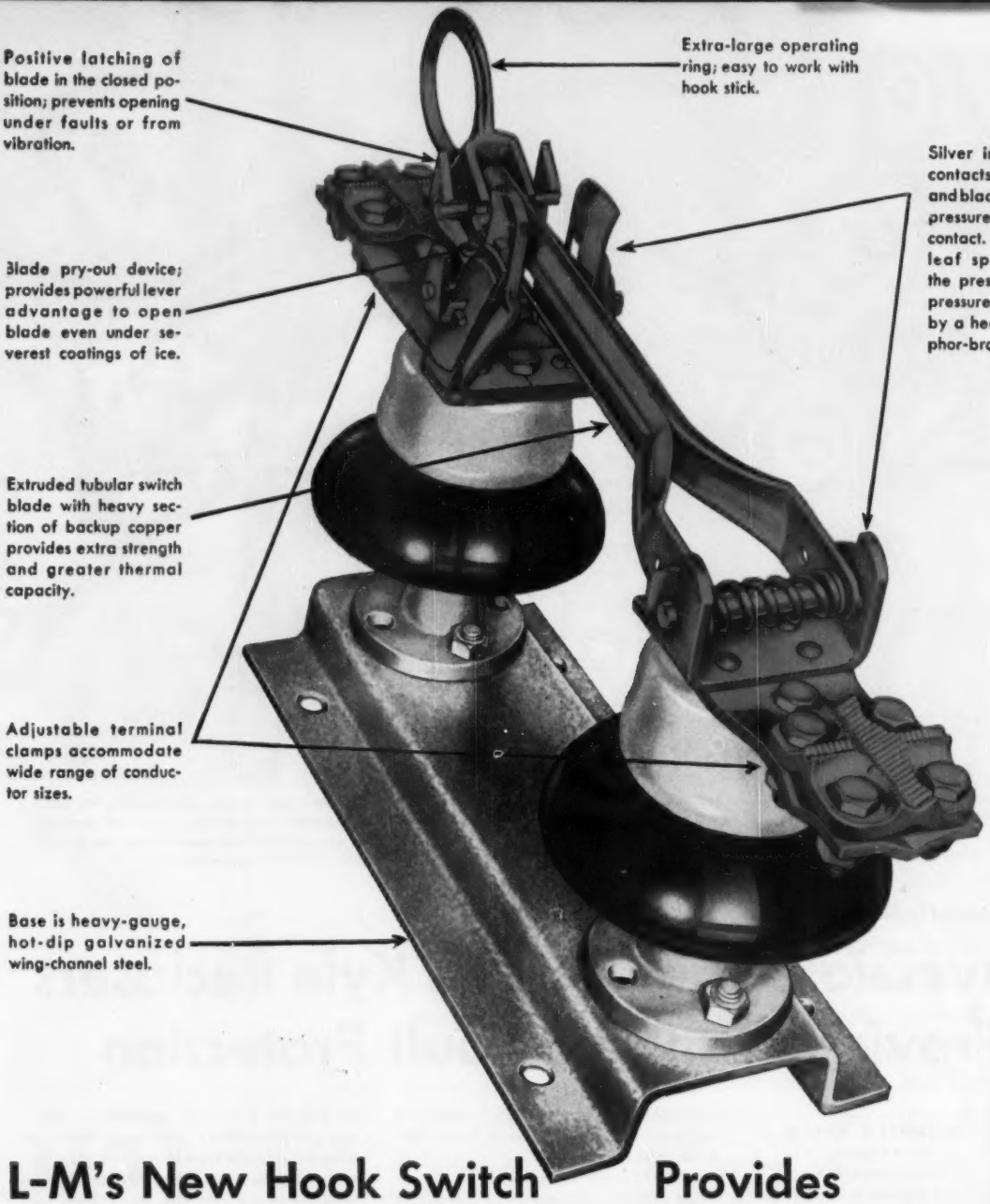
LINE MATERIAL Kyle® Reclosers
A McGRAW ELECTRIC COMPANY DIVISION


Positive latching of blade in the closed position; prevents opening under faults or from vibration.
Extra-large operating ring; easy to work with hook stick.
Silver inserts in front contacts, hinge posts, and blade provide high-pressure silver-to-silver contact. At jaw-end the leaf springs provide the pressure. At hinge, pressure is maintained by a heavy-duty phosphor-bronze coil spring.
Blade pry-out device; provides powerful lever advantage to open blade even under severest coatings of ice.
Extruded tubular switch blade with heavy section of backup copper provides extra strength and greater thermal capacity.
Adjustable terminal clamps accommodate wide range of conductor sizes.
Base is heavy-gauge, hot-dip galvanized wing-channel steel.

L-M's New Hook Switch Provides High Thermal Capacity, Trouble-Free Operation

L-M's new outdoor, hook-operated disconnect switch provides high thermal capacity under short-circuit conditions; assures trouble-free service in sectionalizing, disconnecting or by-passing applications.

This new switch can be mounted on either poles or substation structures, in vertical or inverted position.

Outstanding features include: positive blade lock-in and pry-out devices; minimum of current interchange points; heavy copper tubular switch blade; silver-to-silver high-pressure contacts.

L-M's new hook switch is available in single-pole, single-throw and single-pole, double-throw, *in all three sizes—400, 600 and 1200 amperes, 7.5 kv through 69 kv.*

For full information ask your L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LM® **LINE MATERIAL** 224R

Power Switching Equipment

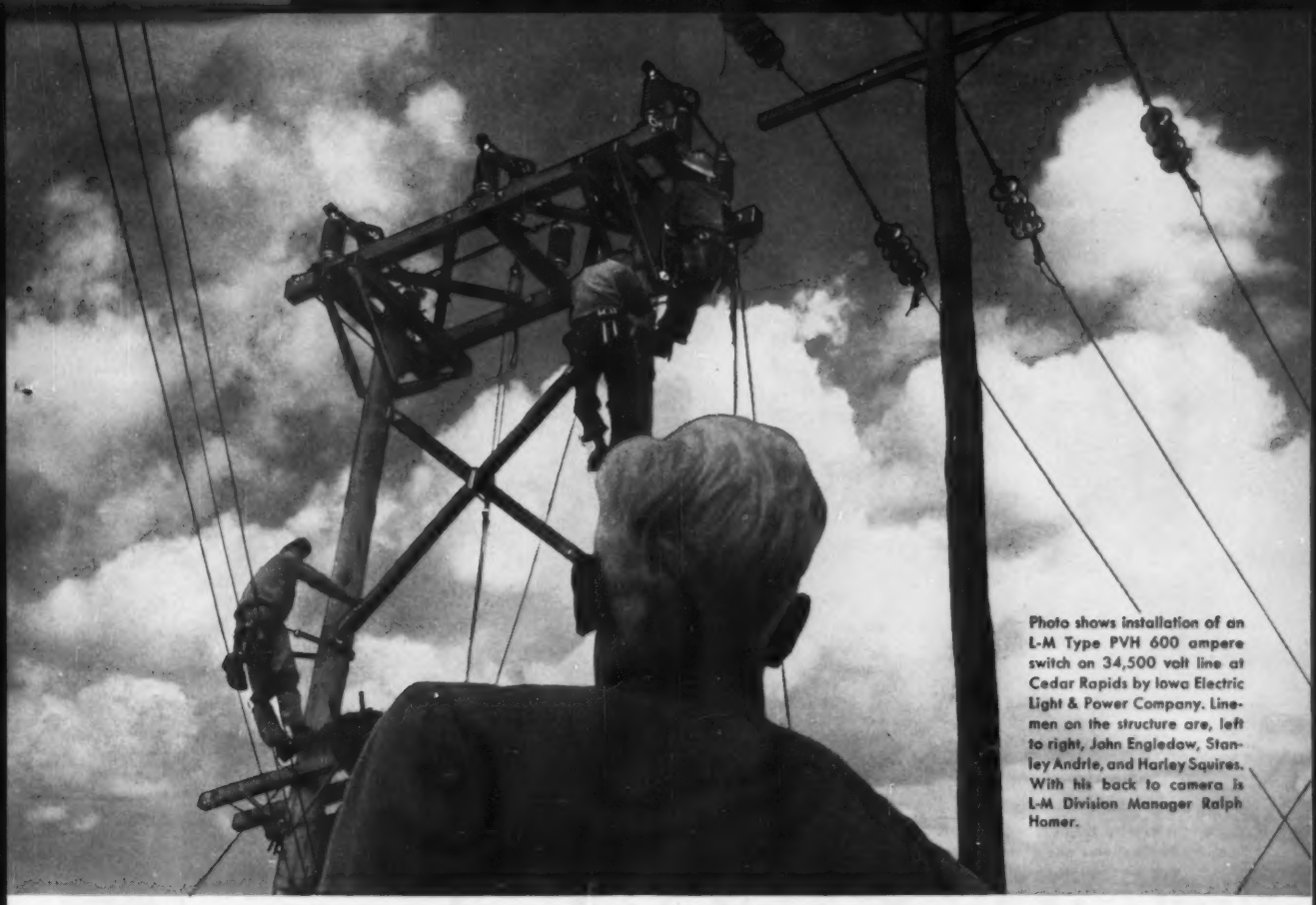


Photo shows installation of an L-M Type PVH 600 ampere switch on 34,500 volt line at Cedar Rapids by Iowa Electric Light & Power Company. Linemen on the structure are, left to right, John Engledow, Stanley Andrle, and Harley Squires. With his back to camera is L-M Division Manager Ralph Homer.

Iowa EL&P Installs L-M PVH Switches To Cut Sparkovers on Lightning Surges

by
HOWARD K. HOLLINGSHEAD
District Operating Mgr.
Iowa Electric Light
& Power Company

The photograph shows the installation of an L-M type PVH air break switch on our lines at Cedar Rapids. The new switch replaced an older switch on a point in the lines that is operated "normally open."

The former switch operated satisfactorily as a normally closed switch, but on normally open service the inadequate clearance caused line tripouts and switch insulator damage caused by lightning surges during thunderstorms. During the summer of 1954, eight of the nine insulators on the old switch were damaged.

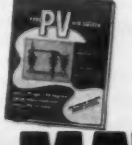
We expect that the new PVH switch has ample clearance and thus will eliminate the trouble. As additional assurance against surges piling up and spilling over, arresters have been installed on each side of the switch one span away.

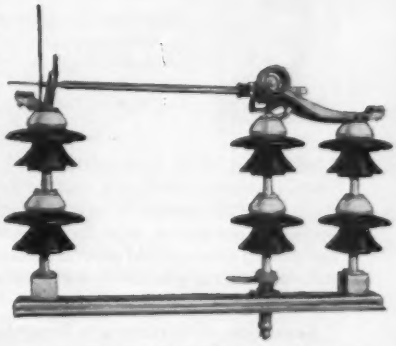
Since it was not practicable to de-energize the circuits joined at this point during installation time, they were dead-ended temporarily on the single pole shown at the right of the photograph, while the switch is being installed on existing poles.

The new L-M switch is being installed under the supervision of Crew Foreman Howard Norris. He and all the members of the crew were particularly pleased by the rugged simplicity of the PVH switch and the ease of assembly and adjustment. He particularly liked the identification of the interphase bars and the foolproof method of installing them.

Get This Bulletin For Complete Information

L-M offers a complete line of vertical air break and hook switches through 1200 amperes and 69 kv. For information and bulletin ask the L-M Field Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).





L-M type PVH switches offer ample clearances; castings of aluminum bronze alloy which make them exceptionally strong and light; and the design provides a powerful lever advantage to assure positive operation regardless of ice, corrosion, or long periods of non-operation.

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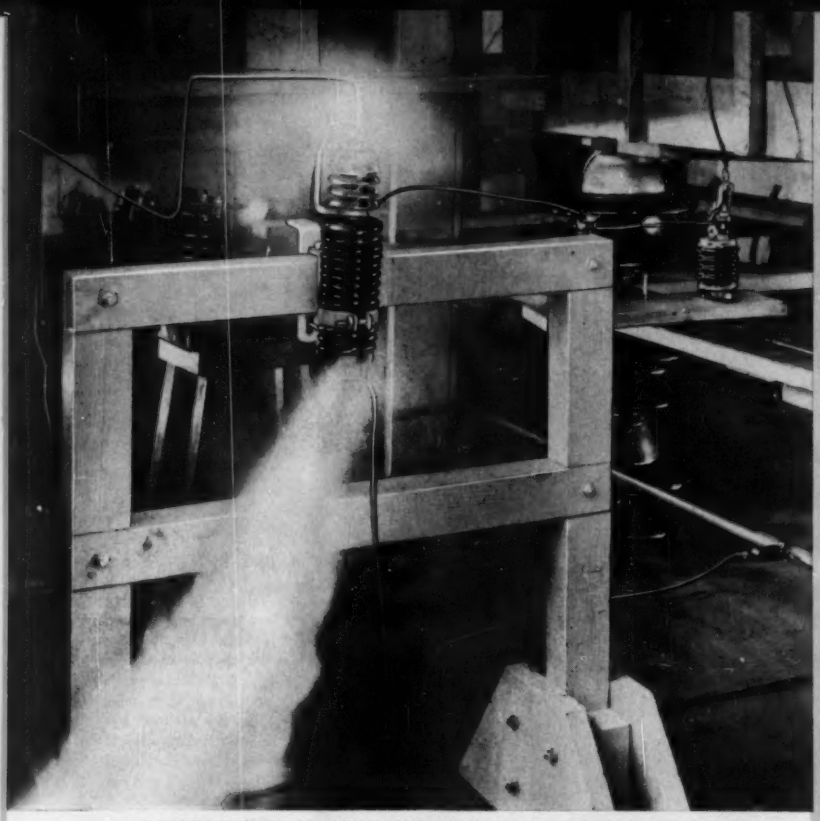
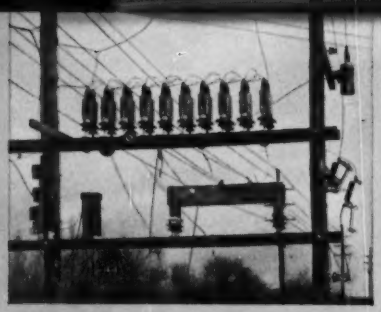
LINE MATERIAL
Power Switching Equipment



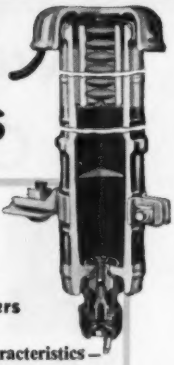
A LARGE NUMBER OF BLOWN FUSES WERE TRACED TO EXPULSION ARRESTERS. Photo shows one of the tests conducted by L-M engineers with the utility engineers that placed responsibility for the outages on the expulsion arresters.



EXTENSIVE FIELD TESTS were made by one utility to prove that *expulsion* arresters were satisfactory. But the evidence was the other way; the company continues to use valve arresters exclusively.

MANY COMPANIES ARE SWITCHING TO VALVE ARRESTERS because valve arresters provide a higher degree of protection. One company not only switched to valve type, but replaced every expulsion arrester on the system. Picture above shows lineman replacing an expulsion arrester with a valve arrester.

Why Valve Type Lightning Arresters Are Better Than Expulsion Arresters



By **GEORGE W. COOPER**
Product Manager
Protective and Power
Switching Equipment
Line Material Company

Line Material is frequently asked, "Which arrester principle is best for my system?" The answer is provided by operating companies who have tested and proved through field experience that *valve arresters are better than expulsion arresters.*

Regardless of differences in design by various manufacturers, there are certain basic differences in the valve *principle*, as compared with the expulsion principle.

The valve arrester operates on the principle of a valve, which "opens," with low resistance to high-voltage, high-current lightning surges, and "closes," with high resistance to 60-cycle follow current.

The expulsion arrester operates on the pressure principle, of expelling the power follow current arc. For this purpose fibre is used to form the gases which expel the arc. This fibre is subject to erosion—and changing characteristics. These limitations apply regardless of differences in design, manufacture, etc.

Listed at the right are four principal reasons why we recommend valve type arresters over expulsion arresters.

Get Complete Information

Details of some of the extensive evidence in favor of valve over expulsion arresters are given in a new booklet, "The Theoretical and Practical Aspects of Lightning Protection for Distribution Systems." Whichever type you use, we believe you'll be interested in this report. Ask your L-M Field Engineer for a copy, or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

FOUR REASONS for recommending valve over expulsion type arresters

1. Better Protective Characteristics — The valve arrester sparks over more quickly and at lower voltages on lightning surges.

2. Unlimited 60-Cycle Capacity — The application of the valve arrester is not limited by the available short-circuit current.

3. No Fuse Coordination Problems — The valve arrester will pass relatively small values of 60-cycle follow current, regardless of system capacity.

4. Longer Life — The valve arrester is electrically and mechanically unaffected in handling lightning discharges usually encountered in service. Its life is relatively unlimited.

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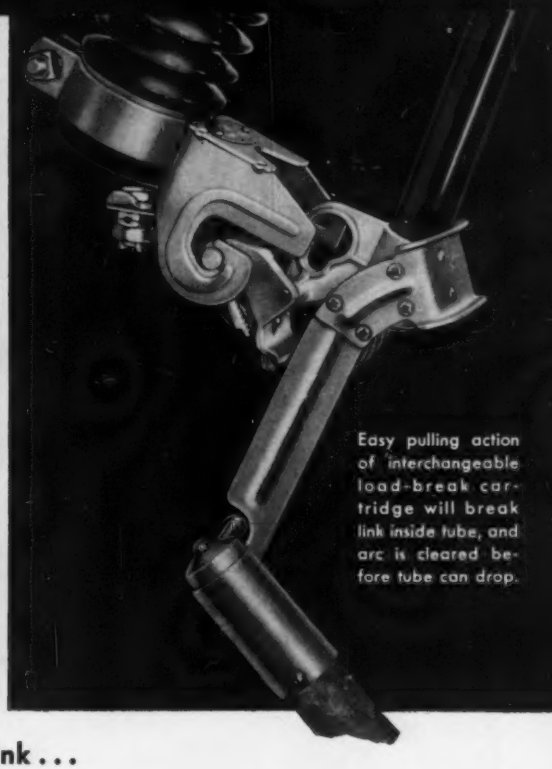
LINE MATERIAL Lightning Arresters

A McGRAW ELECTRIC COMPANY DIVISION

Ring is cut away as reminder to linemen that he should break the link before opening the cutout.

Complete hook-stick removal and replacement of cartridge. Available in 5.2 kv, 7.8 kv, and 15kv voltage ratings.



Easy pulling action of interchangeable load-break cartridge will break link inside tube, and arc is cleared before tube can drop.

Less than 30 lbs. pull to break the largest size link . . .

Interchangeable Load-Break Cartridge Now Available for L-M's HDO Open-Type Cutouts

Load current is extinguished in the tube. Load-break interrupts all capacitive and inductive loads up through 100 amperes. Fault interrupting capacity 10,000 amperes, 5.2 kv, 7.8 kv, and 8,000 amperes, 15 kv.

By **GEORGE W. COOPER,**
Product Manager
Protective and
Switching Equipment
Line Material Company

L-M's big, rugged 100-ampere HDO open-type cutouts with the new interchangeable load-break cartridges provide outstanding operating and design features that assure you of lasting performance and easy operation.

The load-break cartridge utilizes standard 20-inch distribution fuse links. All links through 100 amperes can easily be broken because of the high mechanical advantage of the link-break lever.

A pulling action of less than 30 pounds is required to break the largest size link. The cartridge is designed to insure a complete break of the fuse link and the complete extinguishing of load current in the tube.

The upper pull ring has been cut away to remind the lineman of the link-break feature. This eliminates the danger of pulling open the cutout, through force of habit, without first breaking the link. If, on second thought, it is deemed desirable to open the cutout without breaking the link, this can be done by engaging the hook stick behind the cartridge.

Principal Features of L-M's 100 Amp HDO Open-Type Cutouts

The HDO incorporates many desirable features, assuring positive action and dependable service. These include:

Completely bird-proof construction.

Corrosion-resistant, high-strength hardware, with 4 to 6 times the life of mild steel.

Current-carrying parts all silver-plated brass or copper.

Cartridge firmly anchored for closing-in on faults; tube cannot move upward; cannot pop out of bottom hinges in closing.

All cartridges designed for complete hook-stick removal and replacement.

Maximum interrupting capacities with any size link. Cutout interrupts any fault current from minimum melting of link to maximum cutout rating.

Tin-plated connectors mounted directly on stationary contacts eliminate several current-interchange points.

Tube cannot miss top contacts, which are heavy silver-plated springs. These make a high-pressure contact with the cartridge.

Positive pressure-controlled expendable cap.

Exclusive wedge-type clamping jaw positively prevents link slippage. Jaw teeth firmly grip link leader—the harder the pull, the tighter the grip.

The complete line includes cutouts in the 5.2, 7.8, and 15 kv classes with a full line of conventional and load-break cartridges in standard and heavy duty interrupting ratings, and a 200 ampere switch blade.

Get Complete Information

Ask the L-M Field Engineer for complete information about L-M's complete line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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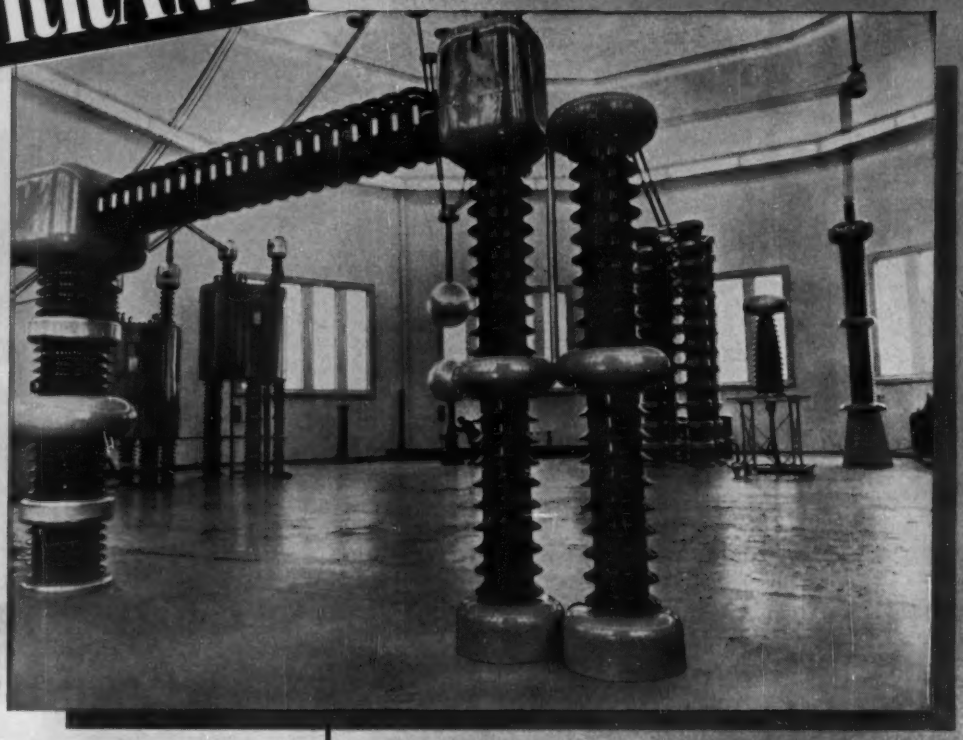
LINE MATERIAL
fuse cutouts and fuse links

FERRANTI

HIGH VOLTAGE TESTING EQUIPMENT



IN NORWAY

The Testing Equipment illustrated has been supplied by Ferranti Ltd. to the Research Laboratory of Standard Telefon og Kabelfabrik A/S, Oslo, Norway. It consists of :

Foreground : 1,000,000 volt D.C. Testing Equipment.

Left . 600 kV, 1,200 kVA , A.C. Testing Equipment.

Background : 12 Stage 2,000,000 volt Impulse Generator.

A 1,500 mm sphere gap and surge potentiometer can also be seen in the background.

TRANSFORMER CAPACITY OF OVER 5,000,000 kVA PER ANNUM

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

FERRANTI LTD. Head Office and Plant : HOLLINWOOD · LANCASHIRE · ENGLAND

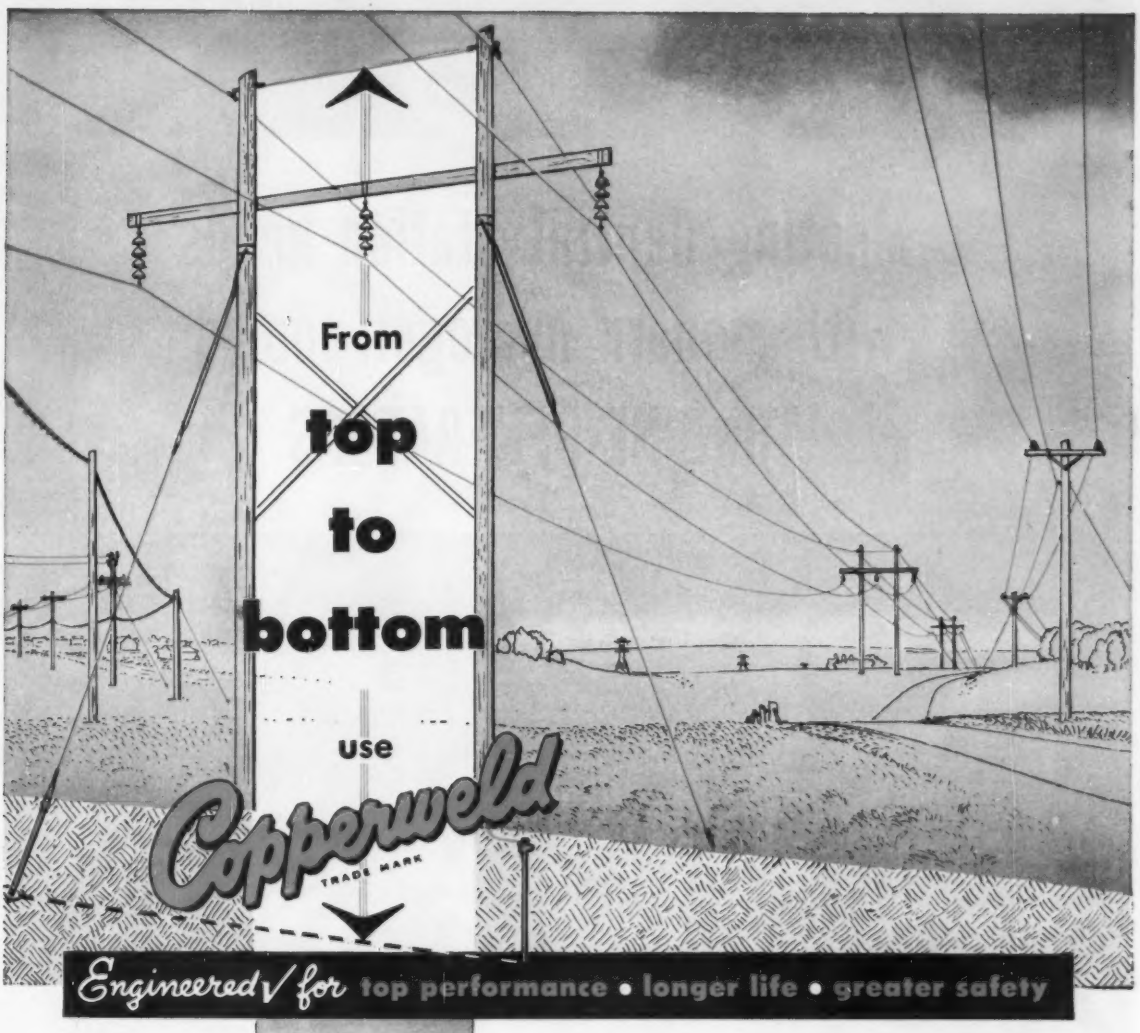
PLANTS AND OFFICES

NEW YORK : Ferranti Electric Inc., 30 Rockefeller Plaza, New York 20, N.Y.

TORONTO : Ferranti Electric Ltd., Mount Dennis, Toronto 15, Ontario.

MANCHESTER, ENGLAND : Ferranti Ltd., Moston, Manchester 10.

EDINBURGH, SCOTLAND : Ferranti Ltd., Ferry Road, Edinburgh 5.

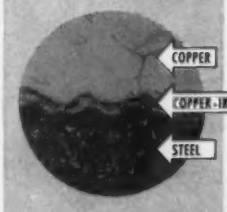


Engineered ✓ for top performance • longer life • greater safety

guy strand ✓
ground rods ✓
overhead ground wire ✓
power conductors ✓
tie wire ✓
messenger strand ✓
pole grounding wire ✓
counterpoise wire ✓
anchor rods ✓

What Copperweld's MOLTEN-WELD means to you!

The perfect, inseparable union of copper and steel—as indicated by this photomicrograph of the Molten-Weld—assures rugged strength, high conductance, rust resistance and long life. Only Copperweld Products offer this unique combination of advantages.



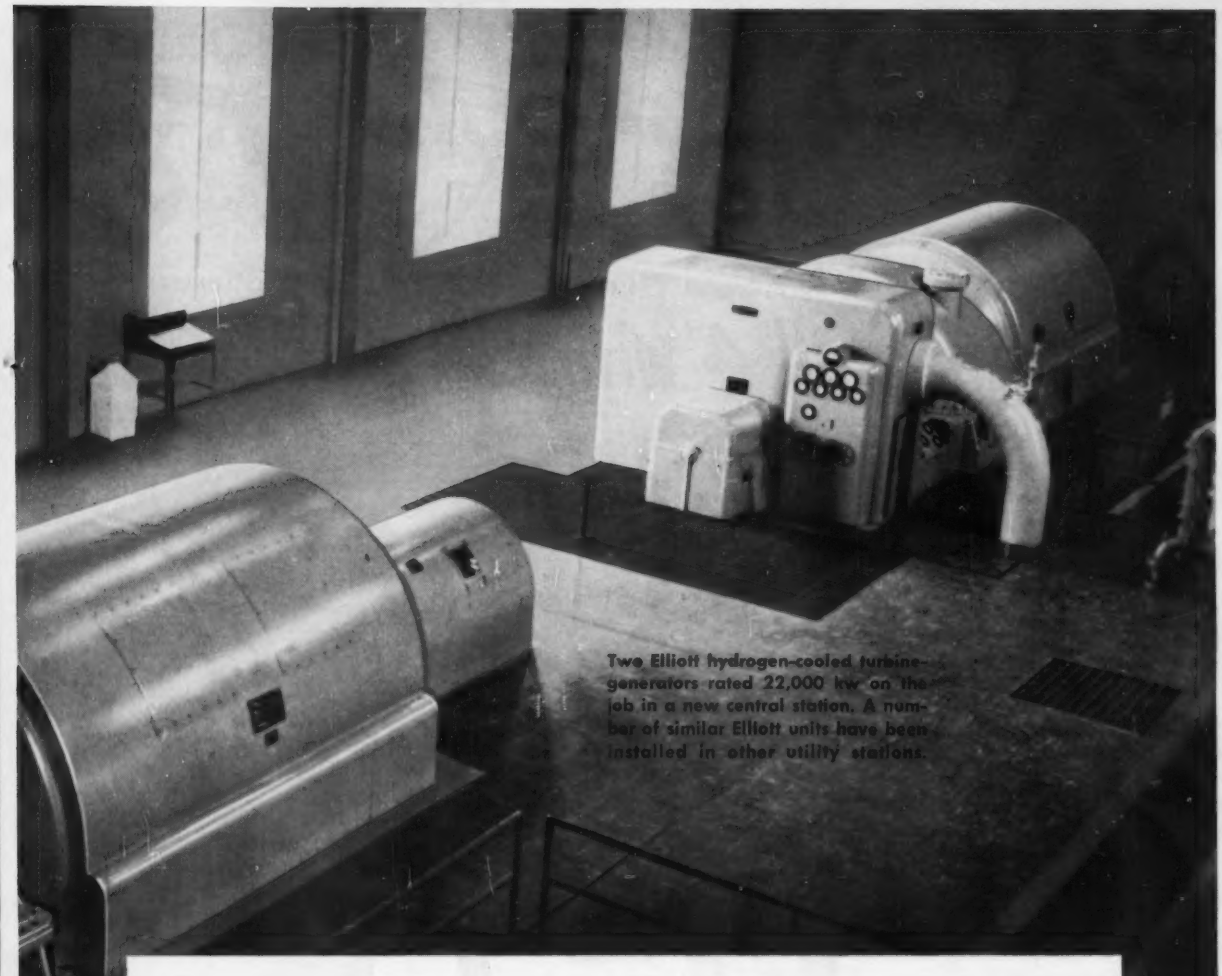
As many of the world's leading power companies well know, it's good engineering to use Copperweld* Products all along the line—from top to bottom. And it's sound economics, too, because Copperweld Products are unequaled for long life and low maintenance. At the same time, they provide the utmost in dependability and safety, thus assuring fewer service interruptions, increased revenue. Remember—when you specify Copperweld, you get the strength of steel plus the conductivity and permanence of copper. Engineering data is available upon request.

*Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION • Glassport, Pa.

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Meeting Central Station needs with modern hydrogen-cooled TURBINE-GENERATORS



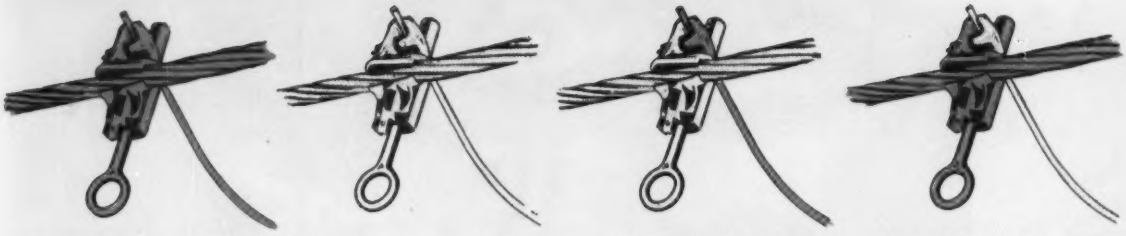
Two Elliott hydrogen-cooled turbine-generators rated 22,000 kw on the job in a new central station. A number of similar Elliott units have been installed in other utility stations.

ELLIOTT

now offers up-to-date hydrogen-cooled turbine-generators to fit utility station requirements. A number of these units in AIEE-ASME Preferred Standard Ratings, such as the two illustrated here, have already been installed and are operating efficiently and economically. To meet such requirements, Elliott shop facilities have been enlarged and new equipment has been added. All components – turbine, generator and exciters – are designed and built by Elliott in Elliott shops. They are designed and built also to produce extra dividends in performance – operating records prove capabilities beyond nameplate rating. See what Elliott can offer on your next hydrogen-cooled turbine-generator job. Call your nearest Elliott District Office or write Elliott Company, Steam Turbine Division, Jeannette, Pa.

ELLIOTT Company

HG-2



COPPER TO COPPER | ALUMINUM TO ALUMINUM | ALUMINUM TO COPPER | COPPER TO ALUMINUM

You can tap all 4 with these AGP* tap clamps

Chance AGP Clamps, approved by power company after power company on the basis of their own tests, can be used for all types of connections: copper to copper, copper to aluminum, aluminum to aluminum, and aluminum to copper.

Chance FORTIFIED cadmium coating, applied .001" thick to the aluminum body of the clamp, resists corrosion and electrolysis in all types of connections. This high density FORTIFIED cadmium coating gives extra long life protection to both the clamp and the conductor.

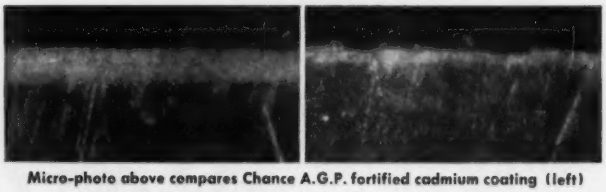
AGP tap clamps have the advantage of light weight which lengthens conductor life by minimizing the effects of vibration and makes them easy to handle on a clamp stick... plus easy identification with the RED EYE SCREW—plus their most important feature, their versatility. You can reduce your inventory and simplify your stocks by standardizing on AGP.

CHANCE PERMA-GRIP TAP CLAMPS

Here's a service-proved tap clamp for all general applications. Gripping jaws of this clamp make a three-point contact with conductor.

CHANCE "P. C." (PROTECTED CONNECTION) CLAMPS

Complete thread protection for easy installation and removal. No threads are ever exposed except in the extreme opened position. Wide jaws contact all strands.



Micro-photo above compares Chance A.G.P. fortified cadmium coating (left) to commercial plating, one reason for A.G.P.'s success.

*Aluminum General Purpose

ABC INDUSTRIES

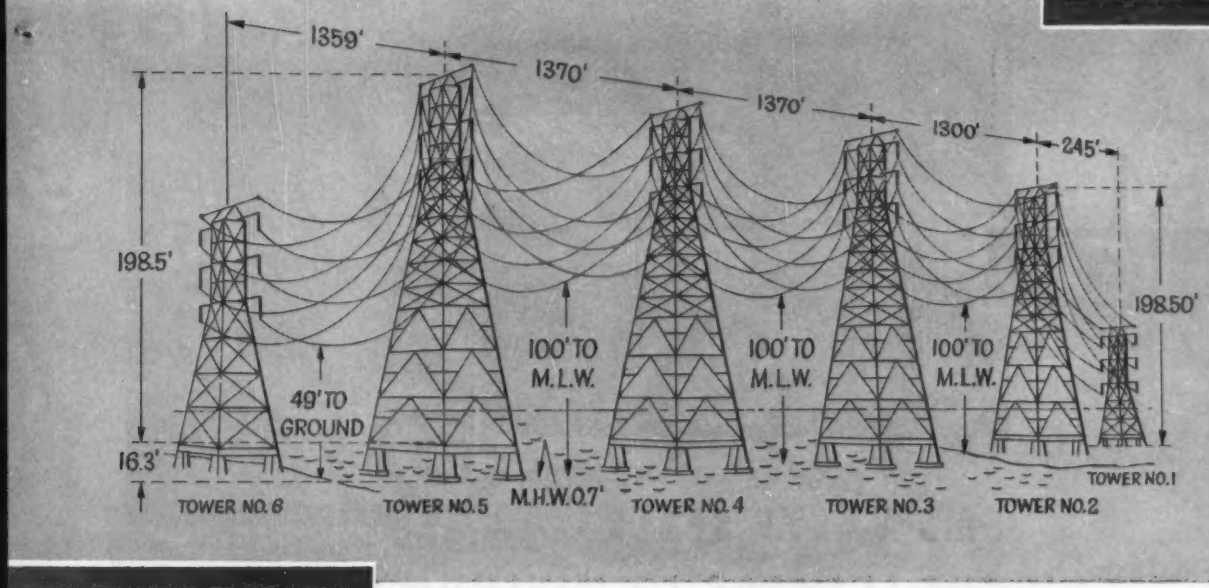
CC56-4

A·B·CHANCE CO·

CENTRALIA, MISSOURI

San Francisco, California • Pittsburgh, Pennsylvania

LIGHTWEIGHT Steel Towers *by* **AMERICAN BRIDGE** *save Florida Power Corporation $7,200 in erection costs!*



Towers designed and fabricated by American Bridge for Florida Power Corporation. Erected by Southeastern Utilities Service Company, Miami.

. . . The three towers in the bay are each 6½ tons lighter, but they are designed to withstand hurricane-force winds of 135 mph!

When the Florida Power Corporation planned its transmission line crossing Old Tampa Bay, water traffic requirements dictated that the towers would have to be tall enough to suspend lines no lower than 100' from Mean Low Water level. After computing the sag of the lines and the suspension required, it was determined that four of the towers (numbers 2, 3, 4 and 5 in the diagram above) would have to be 198' 5" high. This was not too much of a problem. However, the location demanded that the towers be designed to resist hurricane-force winds of 135 mph with an overload capacity factor of 1.25.

To get the strength required and yet keep the towers as light as possible for ease of transportation and handling in that remote, inaccessible area, American Bridge used a high-strength steel (USS MAN-TEN) rather than plain carbon steel in the tower legs to reduce the weight of the four towers by 26 tons.

This reduction in the weight of the four towers resulted in a savings of $7,200 in erection costs.

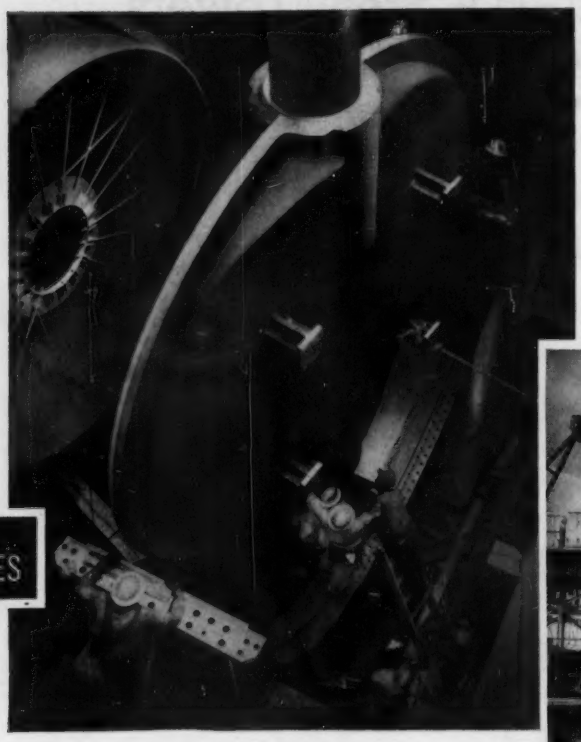
American Bridge towers are made to order for every type of transmission line service. They are designed for simplified erection over water; on level, side-hill, or rocky butte sites. They are engineered for heavy-duty service under the severest climatic conditions. For recommendations based on your particular requirements, just contact our nearest office.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • ELMIRA • GARY • HOUSTON • LOS ANGELES MEMPHIS • MINNEAPOLIS • NEW YORK • ORANGE, TEXAS • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON • UNITED STATES STEEL EXPORT COMPANY NEW YORK

USS

UNITED STATES STEEL



An 18' butterfly valve disc is shown here during installation at Blakely Mountain in Arkansas. Note the streamlining of the welded disc.

Photos—Vicksburg District, Corps of Engineers

SMS
BUTTERFLY VALVES

SMS VALVE SEALS CUT LEAKAGE TO MINIMUM

SMS Butterfly Valve seals cut leakage to a minimum. Disc seals are adjustable from either inside or outside, whichever is specified. Specially-developed SMS trunnion seals are essentially drop-tight.

With inside adjustment, the disc may be seated directly on the plate steel housing, as at Blakely Mountain, illustrated above, and as at Fort Peck, Montana. Here a 16 ft. dia. valve, recently tested after 14 years of service, had *less than ½ gpm leakage*.

SMS welded discs and housings assure greater freedom from the material defects of castings and permit more economical construction. The photo illustrates the streamlining possible with welded steel plate construction. This holds head losses and turbulence to a minimum.

SMS has designed and built butterfly valves in diameters from 3 inches to 18 feet, for service with operating heads up to 750 feet. For the assurance that your hydraulic equipment will meet or exceed specifications, you can rely on over three-quarters of a century of experience that SMS offers. For full information on butterfly valves, hydraulic turbines and accessories, write S. Morgan Smith Company, York, Pennsylvania.

Hydraulic Turbines
Pumps
Gates & Hoists
Trash Rakes
Accessories

HYDRODYNAMICS

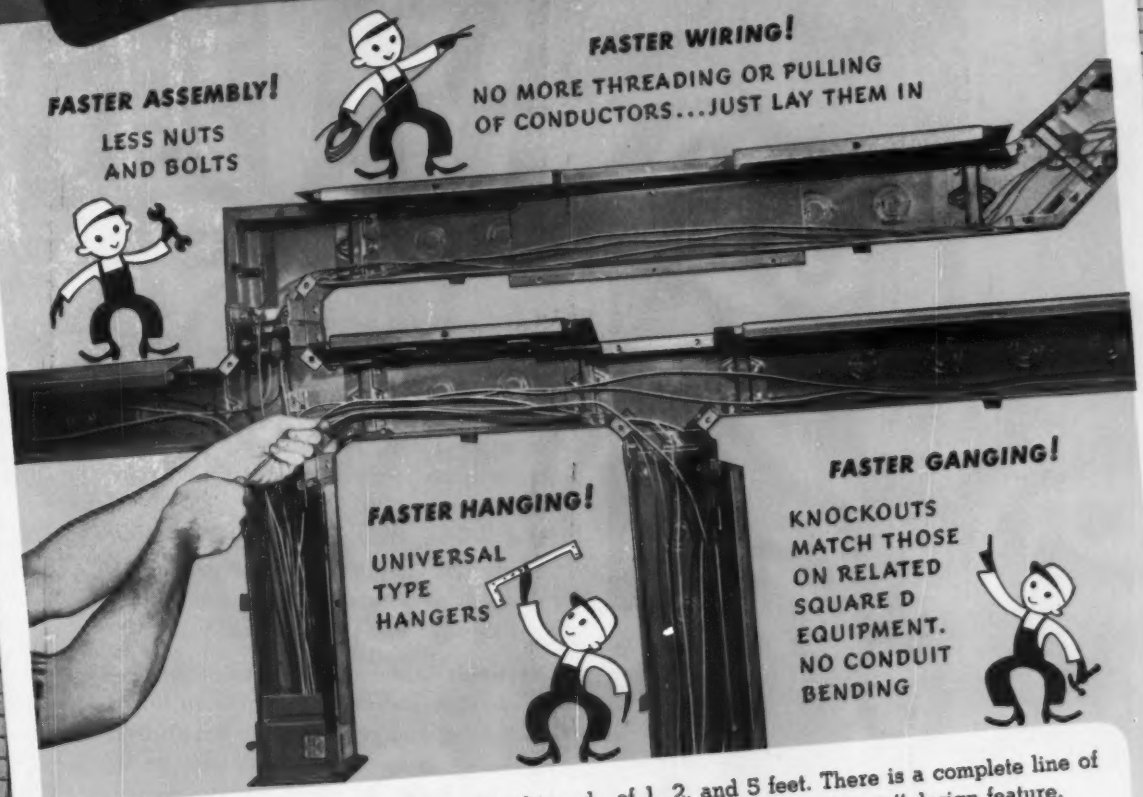
Rotovalves
Ball Valves
Butterfly Valves
Free-Discharge Valves
Controllable-Pitch Ship Propellers

S. MORGAN SMITH CO.

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO

INSTALL WIREWAYS FASTER!

SQUARE D's NEW AND EXCLUSIVE *Lay-in Duct*


FASTER ASSEMBLY!
LESS NUTS AND BOLTS
FASTER WIRING!
NO MORE THREADING OR PULLING OF CONDUCTORS...JUST LAY THEM IN
FASTER HANGING!
UNIVERSAL TYPE HANGERS
FASTER GANGING!
KNOCKOUTS MATCH THOSE ON RELATED SQUARE D EQUIPMENT. NO CONDUIT BENDING

Square D's exclusive design provides hinged covers for both the duct sections and connectors. Easily removable fitting covers then provide a completely unobstructed wireway in which to lay wires.

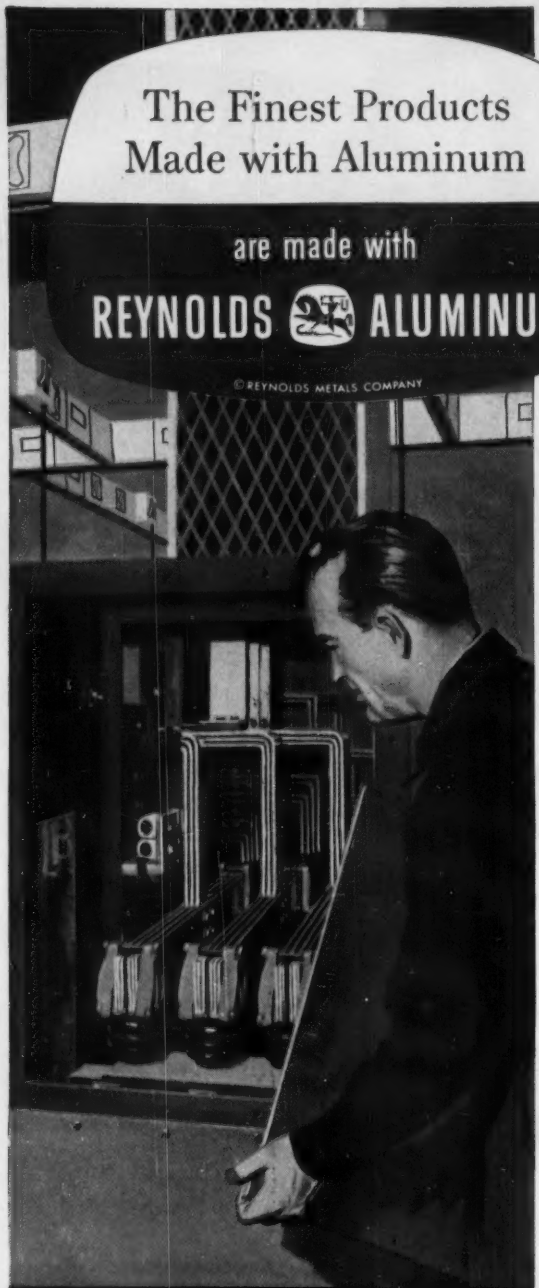
LAY-IN DUCT is available in 2½" x 2½", 4" x 4", and 6" x 6" sizes, in standard lengths of 1, 2, and 5 feet. There is a complete line of fittings, all with the "lay-in" design feature.

• • •

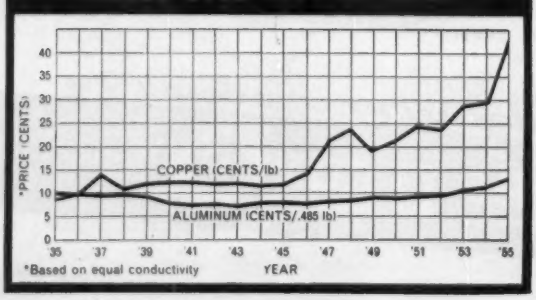
Write for the complete story of **LAY-IN DUCT**—how it gives you a better wireway system, easier, faster and at less cost. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY



TREND OF COPPER AND ALUMINUM PRICES OVER PAST 20 YEARS



*Based on equal conductivity

for example

RABC

(REYNOLDS ALUMINUM BUS CONDUCTOR)

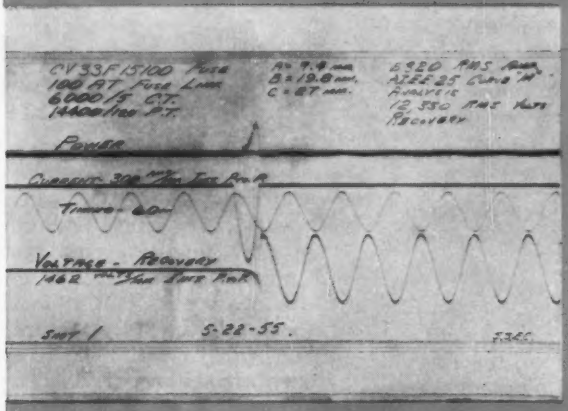
RABC provides greater strength (29,000 psi tensile and 25,000 psi yield guaranteed minimum) with very little effect on electrical conductivity. In addition, a new unlimited range of sizes and shapes in which RABC is available permits designing to the minimum amount of metal needed for the current carrying job. The result is material costs as low or lower than for any previous aluminum bus conductor. And, as the chart shows, from a basic material cost standpoint you can no longer afford not to consider aluminum bus conductor.

Reynolds Engineering Service—available to you in your office and in the field—is an important plus in helping you get maximum benefit from the aluminum you use. For full details on this service and on RABC, ACSR, Covered Conductor, RESC (Reynolds Electrical Strip Conductor) contact your nearest Reynolds Branch Office. Also inquire about stocks of most-used sizes of ACSR and Covered Conductor ready for fast shipment and emergency requirements. Or write *Reynolds Metals Company, P. O. Box 1800-EL, Louisville 1, Kentucky.*

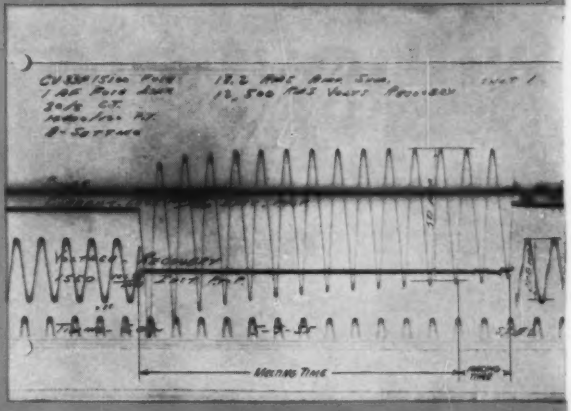
REYNOLDS ALUMINUM

See "Frontier", Reynolds exciting dramatic series — Sundays, NBC-TV

high faults or low faults



HIGH CURRENT TEST In this test the cutout was subjected to a fault of 6320 amperes at a power factor of 19.6%. Arcing time was less than a half cycle. This test was conducted at Georgia Power Company's North Columbus Substation.



LOW CURRENT TEST In this particular low current test, the cutout was subjected to a fault of 18.2 amperes at a power factor of 15.9%. The circuit was cleared after two cycles of arcing time. This test was conducted at Southern States test facilities.

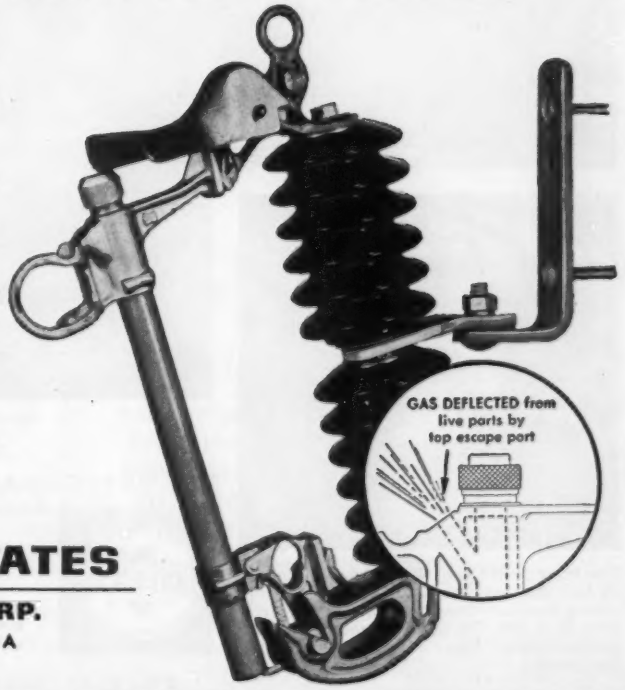
SOUTHERN STATES' CV-33-F TAKES EITHER IN STRIDE

Engineers responsible for system protection often stress the importance of a cutout's ability to clear an overload condition as well as to interrupt maximum faults.

The Southern States Type CV-33-F is designed to give the best possible operation at both extremes.

During its development, Southern States' engineers repeatedly subjected it to both high and low faults. The versatility of the Type CV-33-F Cutout was demonstrated on test after test. Shown above are unretouched photos of oscillograms of two typical tests.

To provide your system with dependable wide-range protection, choose the Southern States Type CV-33-F Cutout.

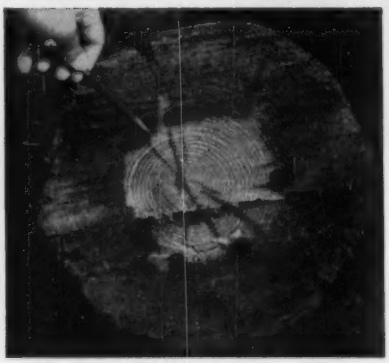


SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA:
Dominion Cutout Co., Ltd., Toronto

Pressure-Creosoted poles on 23-mile line

in service 42 years without a single failure!



The interior of one of the 42-year-old poles. Notice the excellent degree of penetration—how pressure treatment forced the creosote deep into the wood for *thorough* protection against decay and termites through the years.

THIS POWER LINE was installed by the Ohio Edison Company, between Akron and Bedford, Ohio, more than 42 years ago. The pine poles were erected on 125-foot spans, in 40-foot, 45-foot, and 50-foot lengths. Pressure-treated with Creosote, the poles have withstood almost half a century of weather, termites, and decay, without requiring a single replacement.

Recently, because additional pole height was needed, some of the lower level poles had to be replaced by longer ones. They were sawed off just above the ground line, the most vulnerable point of the pole. Inspectors were amazed to find the poles completely sound—good for many, many more years of service. Especially significant is the fact that the soil was very moist most of the time, and in some cases there had actually been water in the bottom of the pole holes. Yet, the poles were in perfect condition.

To get this kind of quality and long life—30 years or more—always insist on clean poles, pressure-treated with Creosote . . . the proven preservative. For more information, write to Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pennsylvania.

DON'T GAMBLE — USE
THE PERFORMANCE-PROVED WOOD PRESERVATIVE

KOPPERS

CREOSOTE

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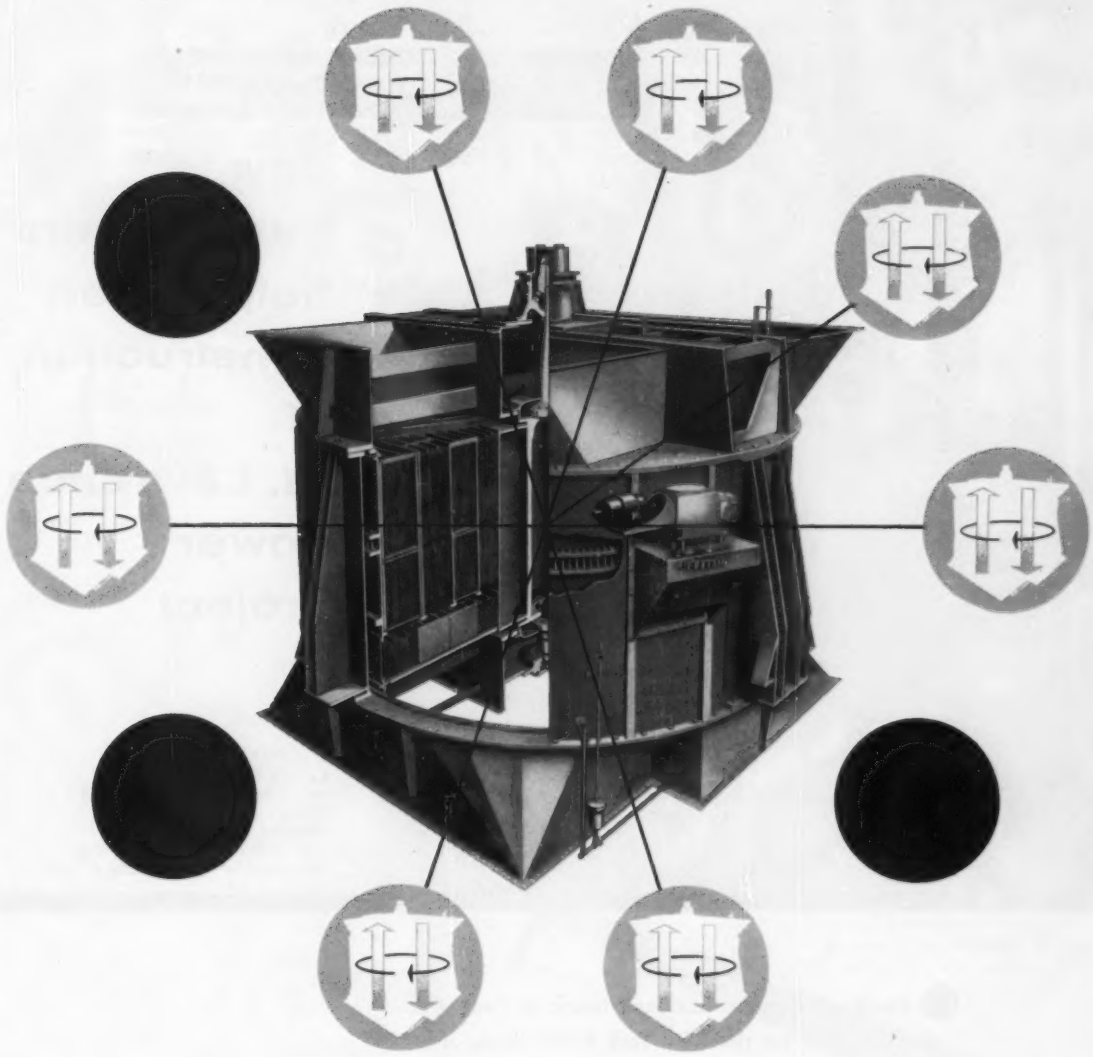


7 out of 10 air preheater installations are Ljungstrom®

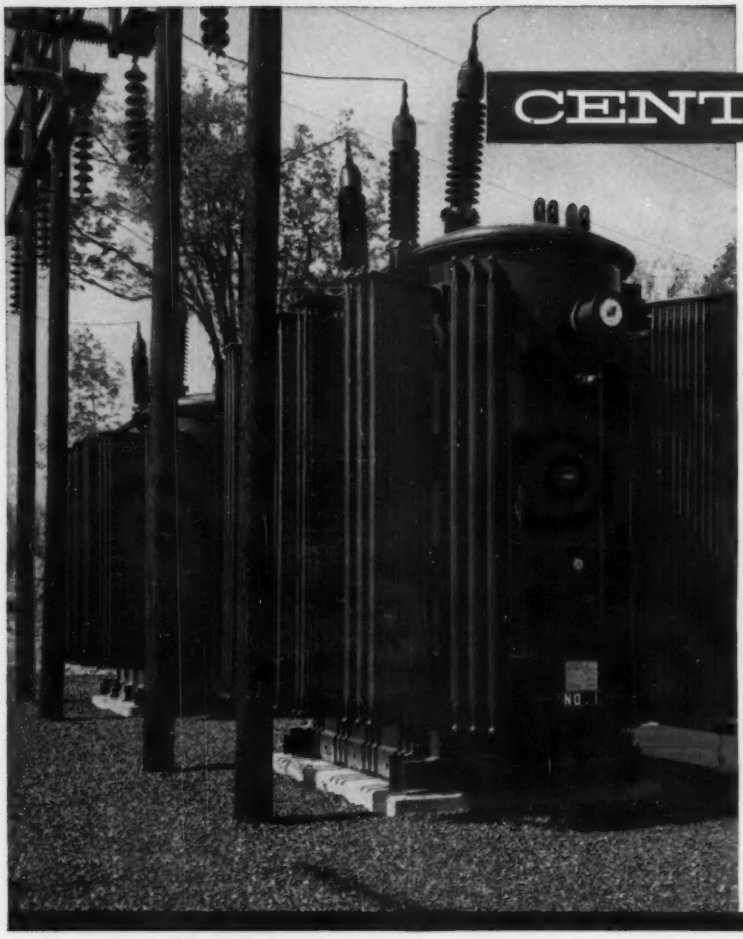
Advantages of the Ljungstrom Air Preheater

- Size for size, recovers more heat than any other type.
- Reduces fuel consumption. Permits use of lower-grade fuels. Increases boiler output and reliability.
- Eliminates cold spots . . . keeps corrosion to a minimum.
- Easier, faster to clean and maintain.
- Requires far less supporting steel and is quickly erected.

FUEL ECONOMY is the big reason. Size for size, the Ljungstrom recovers more heat than any other type of air preheater. And with every 45-50 F of air preheat you cut your fuel bill 1%.

Write now for your copy of our 38-page manual, for handy reference.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.



CENTRAL

power transformers help speed construction of St. Lawrence power project

2 10,000 KVA, 3-phase 115 KV to 13.8 KV Central transformers now in service at Polley's Bay Substation, Massena, N. Y. Uhl, Hall & Rich, Boston, Mass., engineers for St. Lawrence Project.

Designed, manufactured and tested in Central's modern plant for the New York Power Authority, these Central transformers are furnishing power for the construction of the gigantic St. Lawrence Power Project.

No matter what your requirements may be, there's a precision-built Central transformer to fill them to your complete satisfaction. We welcome your inquiries.

a type for every need . . . from the smallest to the largest

DESIGNERS AND MANUFACTURERS OF TRANSFORMERS ONLY

CTC NEMA

Sales offices in principal cities
PINE BLUFF, ARKANSAS

Central

NEW! BY THE MAKERS OF Actionrod FISHING TACKLE—

EXTENDO Fiberglass POLES

FOR ROUTINE MAINTENANCE WORK AND EMERGENCY LINE HANDLING

EXTENDO

"Hot Stick"

LETS MAINTENANCE MAN WORK SAFELY FROM THE GROUND

• Light • Safe • Convenient

• Durable • Non-Conductive—Tested to 100 KV per foot by Electrical Testing Laboratories, Inc.

● Called by many the biggest improvement in line handling, and general purpose utility tool in years, the EXTENDO fiberglass "Hot Stick" is an adaptation of the famous Extendo fishing rod. Light weight, compact, easy to carry, use, and store, the Extendo is saving time and money for utility linemen and maintenance men throughout the country.

★ Weighs less than 7 lbs. 16'-20'-24' and 28' lengths.

★ High dielectric properties.

★ Joints doubly reinforced to prevent splitting—no warping.

★ Universal Head takes lightweight, standard "fit on" tools.

★ Sections lock securely for both push and pull operations.

Order EXTENDO "Hot Stick" Samples Today!

To: Orchard Industries, Inc., Hastings, Michigan

Gentlemen:

Please rush me full information about Extendo Fiberglass Hot Sticks . . . . . ☐

Enclosed is our purchase order for samples (when ordering check size indicated below) . . . ☐

( ) 16' Extendo Hot Stick @ $40.00 ( ) 24' Extendo Hot Stick @ $64.50

( ) 20' Extendo Hot Stick @ $52.00 ( ) 28' Extendo Hot Stick @ $78.50

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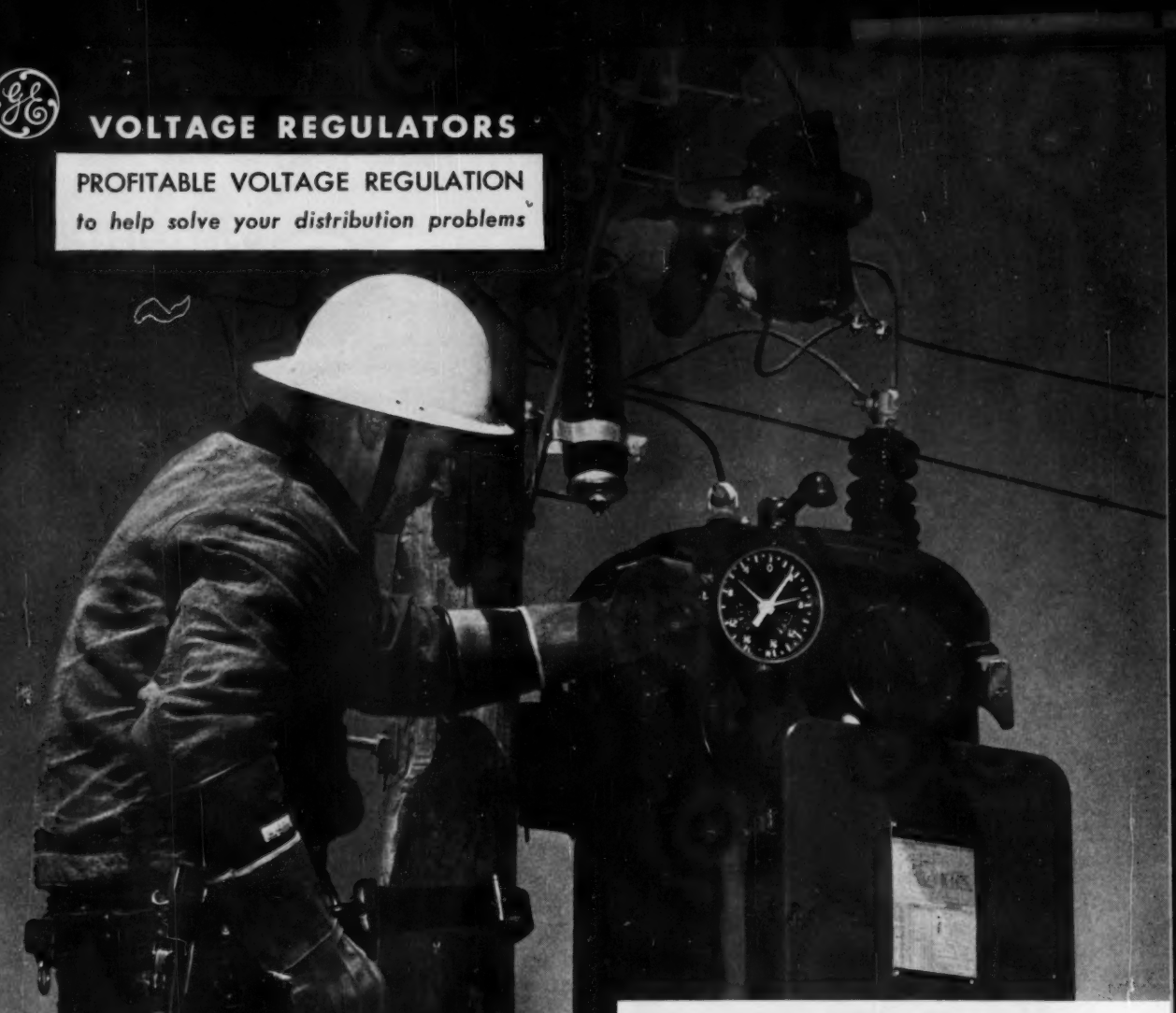
VOLTAGE REGULATORS

PROFITABLE VOLTAGE REGULATION

to help solve your distribution problems



NEW SIMPLE EXTERNAL ADJUSTMENT of regulating range, made on the pole without de-energizing, *increases current capacity* up to 160% of rated amperes.

Select Desired Regulating Range With New Position Indicator	Current Capacity of ML-32 Increases* (Shown as percentage of rated current)
± 10%	100%
± 8¾%	110%
± 7½%	120%
± 6¼%	135%
± 5%	160%

*To a maximum of 400 amperes

NEW CONTROL PANEL has been redesigned in order to make inspection easier and more accurate. This means you can reduce maintenance costs by using ML-32 regulators.

With NEW G-E LOAD BONUS POSITION INDICATOR you can now

INCREASE CAPACITY WITH REGULATOR ENERGIZED

NEW LOAD BONUS switch located in the position indicator of the redesigned General Electric ML-32 step voltage regulator now permits simple, one-man, on-the-pole adjustment of current capacity and regulating range *without de-energizing* the regulator. With "raise" and "lower" settings independently adjustable, current capacity up to 160% of normal at ±5% regulation is available up to 400 ampere maximum. *Load Bonus is now standard equipment on all G-E pole and station-type single-phase step regulators.*

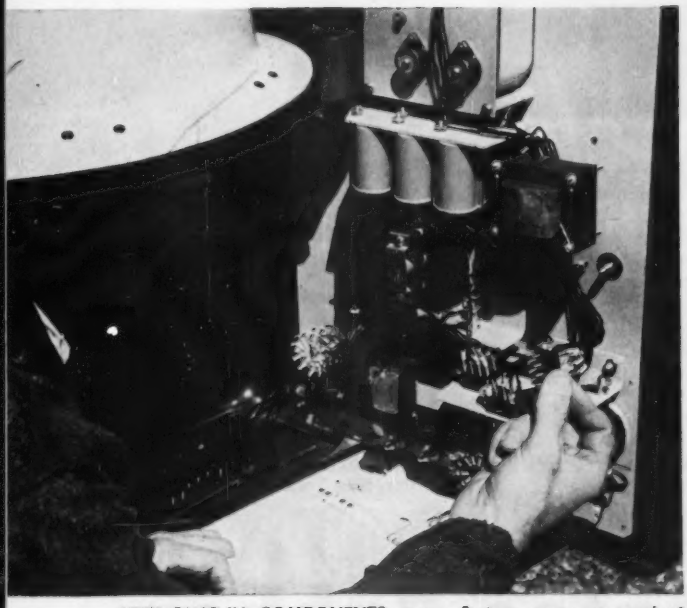
OTHER NEW FEATURES that mean increased dependability, accuracy, and economy include quickly interchangeable plug-in control components; internal channel design for easier, safer untanking by one man; and a larger, clearer tap-position indicator for improved visibility. These features, shown in detail on these pages, make this the most advanced step regulator on the market today.

UP TO 50% SAVING in first cost, compared with all other types of feeder or station regulating equipment, is an additional benefit of the new G-E ML-32 step regulator. A complete line is available —25 to 167 kva and in five voltage classes.

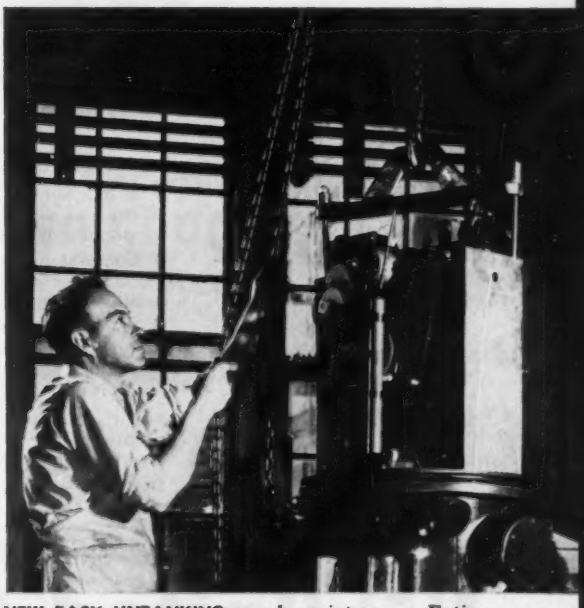
COMPLETE INFORMATION is contained in a new bulletin, GEA-5752. For your copy, contact your G-E Apparatus Sales Representative, or write to General Electric Company, Section 423-14, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

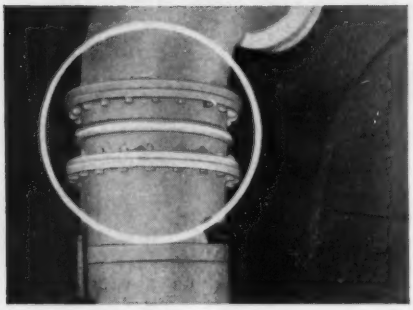


NEW PLUG-IN COMPONENTS mean faster, more economical maintenance. Voltage-regulating relay, line-drop compensator, time-delay relay, and the control panel itself all have quickly removable plug-in connectors.



NEW EASY UNTANKING speeds maintenance. Entire regulator is a one-piece assembly mounted between protective supporting channels. Lifting eyes at top of channels allow quick, safe removal by one man.

How long can a U. S. Rubber Expansion Joint last



...some have been on the job since 1926, the year they were invented!

Here are just a few reasons why *these flexible connections are used in pressure or vacuum pipe lines...*

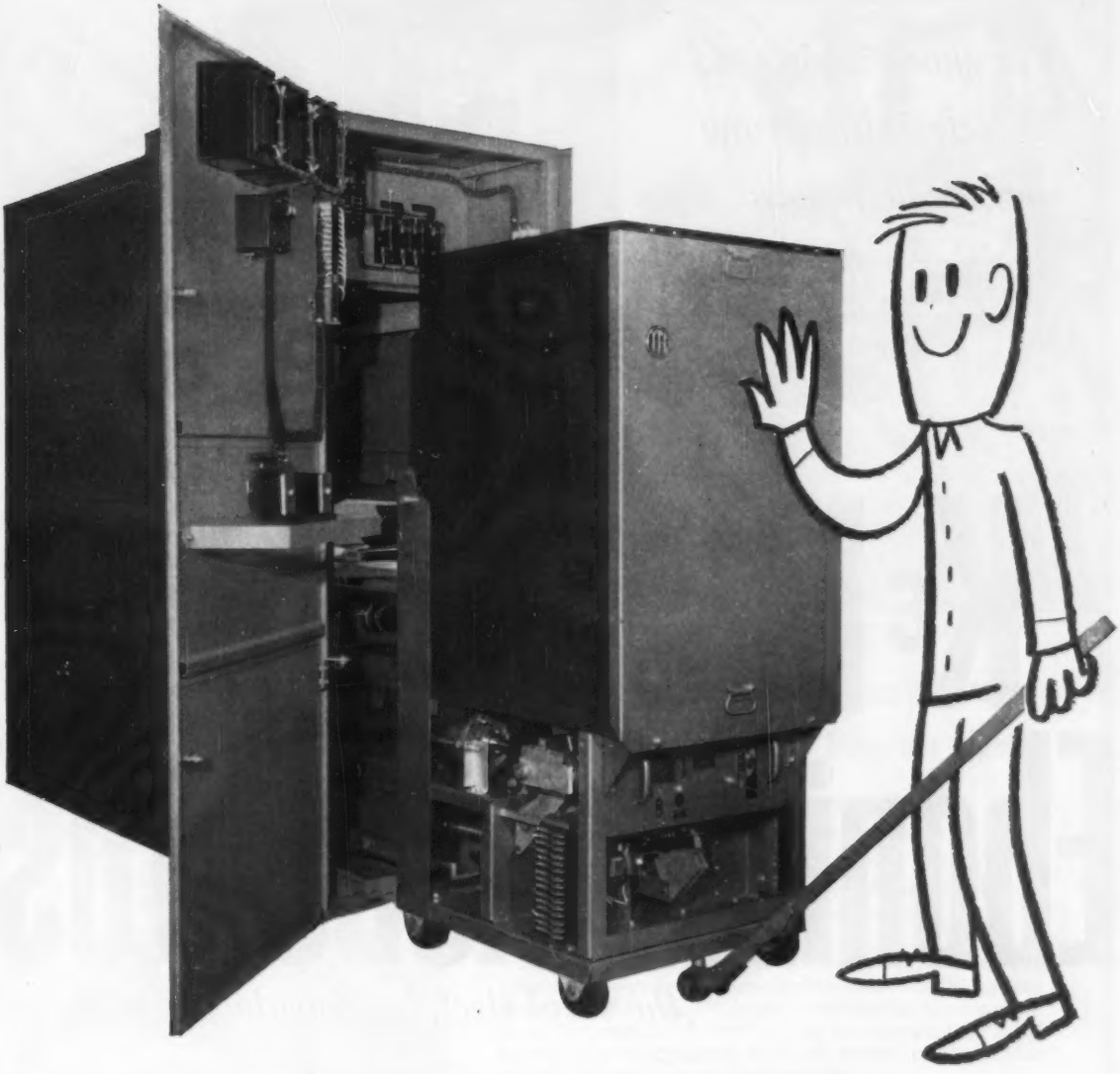
- U. S. Rubber Expansion Joints are resilient and, therefore, do not, like metal, set permanently when compressed.
- Constant flexing merely keeps "U. S." joints "alive"...prevents them from becoming brittle.
- They absorb both axial *and* lateral deflection far more than metal joints. Greater insulation against vibration and pump noises is provided.
- There is never any electrolysis, corrosion or erosion.
- U. S. Rubber joints handle pressures from 40 lbs. to 125 lbs. Compare!
- The outside diameter of the arch is smaller than that on metal joints. Face-to-face dimensions (even with multiple arches) are smaller.
- Weight is much less. This, plus the fact that no gasket is needed between flanges (unlike metal joints) results in a more easy installation, lowering the cost.

"U. S." was the first to develop rubber expansion joints. They are at work in every kind of industry, prolonging the life of equipment in pressure or vacuum pipe systems. Obtainable at any of the 28 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

US RUBBER

Mechanical Goods Division

United States Rubber



I-T-E Metal-Clad Switchgear—positive protection through 500,000 kva

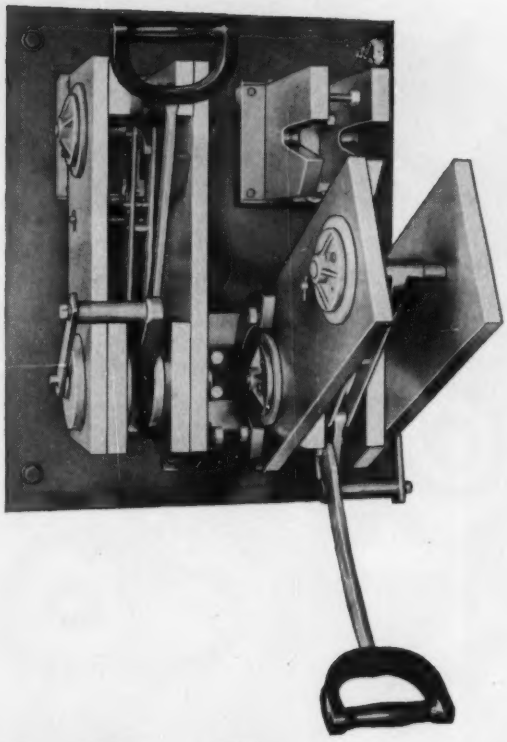
Made in 3 basic voltage ratings (5 kv, 7.5 kv and 15 kv) with interrupting ratings of 150, 250 and 500 mva. Throughout this line of modern gear, time-proved features add extra value. Horizontal drawout circuit breakers are jig fitted to enclosures. Rigid welded frames and housings can be lifted as a unit without loss of alignment. Use of porcelain and epoxy insulation, plus complete isolation of compartments, provides safety and continuity of service.

Why not take advantage of I-T-E quality—it means years longer trouble-free service in your plant. For more information, contact your nearest I-T-E sales office. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division

For shock resistant, dielectrically-strong mounting panels...

Ebonized Asbestos forms a sturdy mounting panel for this 10,000 ampere, 110-volt disconnecting switch made by Pringle Electrical Manufacturing Company, Philadelphia.



K&M Ebonized Asbestos

the ideal electrical insulating material

Use K&M Ebonized Asbestos for switchboards, bus bar supports, cabinets, compartment linings, bench boards, testing tables—wherever you need rugged insulating material for mounting electrical apparatus.

It has exceptionally high dielectric strength. Its high mechanical strength provides stubborn resistance to vibration, shock, temperature changes—and makes components stay put. Ebonized Asbestos is relatively light in weight, uniform in density, easy to cut and drill.

These specifications tell the story

Density	120 lbs. per cubic ft., min.
Safe working temperature	300° F.
Tensile strength	3000 psi, min.
Compression strength	11,000 psi, min.
Modulus of rupture in flexure	4000 psi, min.
Moisture absorption	1.0% max.
Dielectric strength (Tested perpendicular to thickness per ASTM D149-44 [short-time test].)	Ranges from 50 volts per mil., min. for thicknesses of ½" and less to 25 volts per mil. for thicknesses over 1¾ to 2".

Send for data. We'll gladly send complete information on Ebonized Asbestos and other outstanding K&M insulating materials, including Monobestos, asbestos cloth, tapes and tubing for electrical equipment. Write for details.

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K&M best in asbestos®

In Canada: Atlas Asbestos Company, Limited; Montreal, Toronto, Winnipeg, Edmonton, Vancouver

Pipe extruded by Busada Manufacturing Co., Maspeth, L. I., N. Y.

Lengths of Tenite Butyrate conduit are easily joined with solvent cement and slip-sleeve couplings.

Note the bend that can be taken by this conduit without the need for special angle fittings.

Conduit is terminated with belled ends which permit easy cable pull-through with minimum of friction.

Long Island Lighting Company installs cable conduit of Tenite Butyrate plastic

Tenite Butyrate offers these advantages:

- **It's resilient; yields to ground movement**
- **It has high impact strength**
- **It curves around obstructions and uneven contours**
- **It saves time and labor in installation**

Tough, durable and easy to work with, Tenite Butyrate plastic has found wide acceptance as a non-corrodible material for oil, gas and water pipe in outdoor and underground installations. In recent years, its use has expanded to cable conduit. For example, Long Island Lighting Company, Hicksville, N. Y., has recently installed conduit of Tenite Butyrate to carry telephone cable.

Savings in time and labor, as well as ease of installation, were important factors affecting the material's selection. But perhaps the most decisive was Butyrate's resilience, which enabled it to meet the specific requirements set by the marsh conditions encountered. Tenite Butyrate's advantage was that it would yield, instead of fracturing, under the settling of marsh-land fill.

You'll find cable conduit made of lightweight Tenite Butyrate easy to handle, cut and join. It can be curved around most obstacles. And it's unaffected by corrosive or electrolytic action of soil. Investigate its use in your operations... for a booklet describing conduit made of Tenite Butyrate and a list of manufacturers supplying it, write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE
BUTYRATE
an Eastman plastic

For top value . . . in any type . . . get JENKINS

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FRICTION · RUBBER · PLASTIC

PLENTY OF TACK—LOOK AT THE 'TEETH'

NO PINHOLES

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STRONG FABRIC WRAPS TIGHT

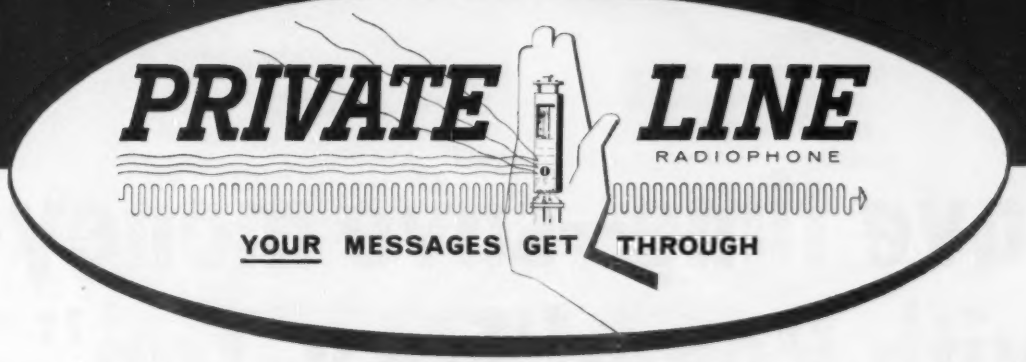
BEST BUY FOR PLANT SUPPLY

All types of **GOLD SEAL TAPE** — Friction, Rubber, Plastic — are packed in 10-roll cartons as well as single rolls.
Every roll cellophane-protected, stays fresh.
Jenkins Bros., Rubber Division, 100 Park Ave., New York 17.

DIAMOND SEAL
Friction and Rubber Tapes
are also made by Jenkins Bros. to ASTM specifications

TRADE JENKINS MARK SINCE 1804 Jenkins Bros

Triumph over Channel Chatter



THE NEW DIMENSION IN 2-WAY RADIO COMMUNICATION

Truly a new concept in two-way radio communications—the result of years of extensive engineering and "on-the-job" field testing. Now you can "get off the party line". No longer is it necessary to listen to a constant stream of "channel chatter". PRIVATE-LINE radiophone is *completely quiet* except when receiving a call from another PRIVATE-LINE radiophone in the same operation.

- **reduces missed and misunderstood messages**—operators hear only messages within their own operation.
- **increases overall efficiency**—fewer errors mean more productive utilization of time—fewer repeat messages—more dispatched vehicles per hour . . . real advantages during peak load periods.
- **increases area coverage**—"coded squelch" circuit automatically maintains optimum receiver sensitivity, assuring maximum communications range at all times.
- **easier to operate**—no additional buttons, lights, adjustments or operational techniques—elimination of squelch adjustments makes it even simpler to operate than conventional two-way radio.
- **reduces operator fatigue**—elimination of "channel chatter" enables operators to concentrate on their jobs—reduces tension, providing a more pleasant atmosphere—increases job satisfaction.
- **selective**—This amazing new circuit opens the speaker only when receiving a properly coded transmission from a PRIVATE-LINE radiophone in the same operation. NUISANCE NOISE, MESSAGES FROM NEARBY SYSTEMS ON THE SAME CHANNEL, AND SKIP INTERFERENCE FROM DISTANT SYSTEMS *CANNOT* UNLOCK THE SPEAKER.
- **automatic**—does not require manual adjustment—electronically maintains feather edge sensitivity at all times.
- **silent**—coded subcarrier is inaudible—normal carrier-off noise burst or "squelch tail" is eliminated from the output of mobile receivers.
- **built-in**—tone circuitry is incorporated as an integral part of compact transmitter and receiver chassis.
- **precise**—Motorola's exclusive VIBRASENDER and VIBRASPONDER electromechanical resonant tone devices assure precision stability, selectivity, and reliability.

Technical men will be quick to note that PRIVATE-LINE radio does not employ a conventional tone-pulse selective calling system, but, instead, a continuous inaudible tone-coded subcarrier system which opens the speaker only for calls from transmitters in the system. Interfering signals cannot "trip-open" or "lock-in" the speaker, since only the properly tone-coded carrier keeps speaker open.

MOTOROLA
2-Way Radio

Private-Line

MOTOROLA Communications & Electronics, Inc.
4501 Augusta Boulevard Chicago 51, Illinois

Send coupon now for illustrated brochure.

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Organization _____

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Save time—save money with Rome "Easy-Tap"

preassembled "Reverse-Lay" aerial cable

Now you can get all the advantages of a self-supporting aerial cable with these Rome "Easy-Tap" cost-saving benefits.

- It can be "hot tapped" easily and quickly without cutting conductors.
- The completely assembled cable is simple to install, tap, splice and terminate.
- The distance between reversals is short enough—approximately 5 feet—to permit opening the cable at the pole without use of platform or special equipment.
- Requires less pole hardware.

Rome "Easy-Tap" aerial cable is factory assembled and features a "Reverse-Lay" construction. As the name implies, the lay of the power conductors around the supporting messenger is reversed at regular and frequent intervals. This facilitates the making of taps before or after installation while the cable is energized or "hot." The reversed sections provide sufficient slack in the insulated conductors for linemen to make a tap simply by removing the binder tape and untwisting the conductors to be tapped.

Rome "Easy-Tap is especially suitable for the 5000-volt, unshielded service range and may be manufactured with a RoZone, premium oil base, ozone-resistant insulation and either RoPrene (Neoprene) or Ro-Seal (flame-resistant polyethylene) sheath. Manufactured in sizes through 500,000 CM.

Contact your nearest Rome Cable office or write direct to Engineering Department, Rome Cable Corporation, Rome, New York, for help with your particular application.

It costs less to buy the best

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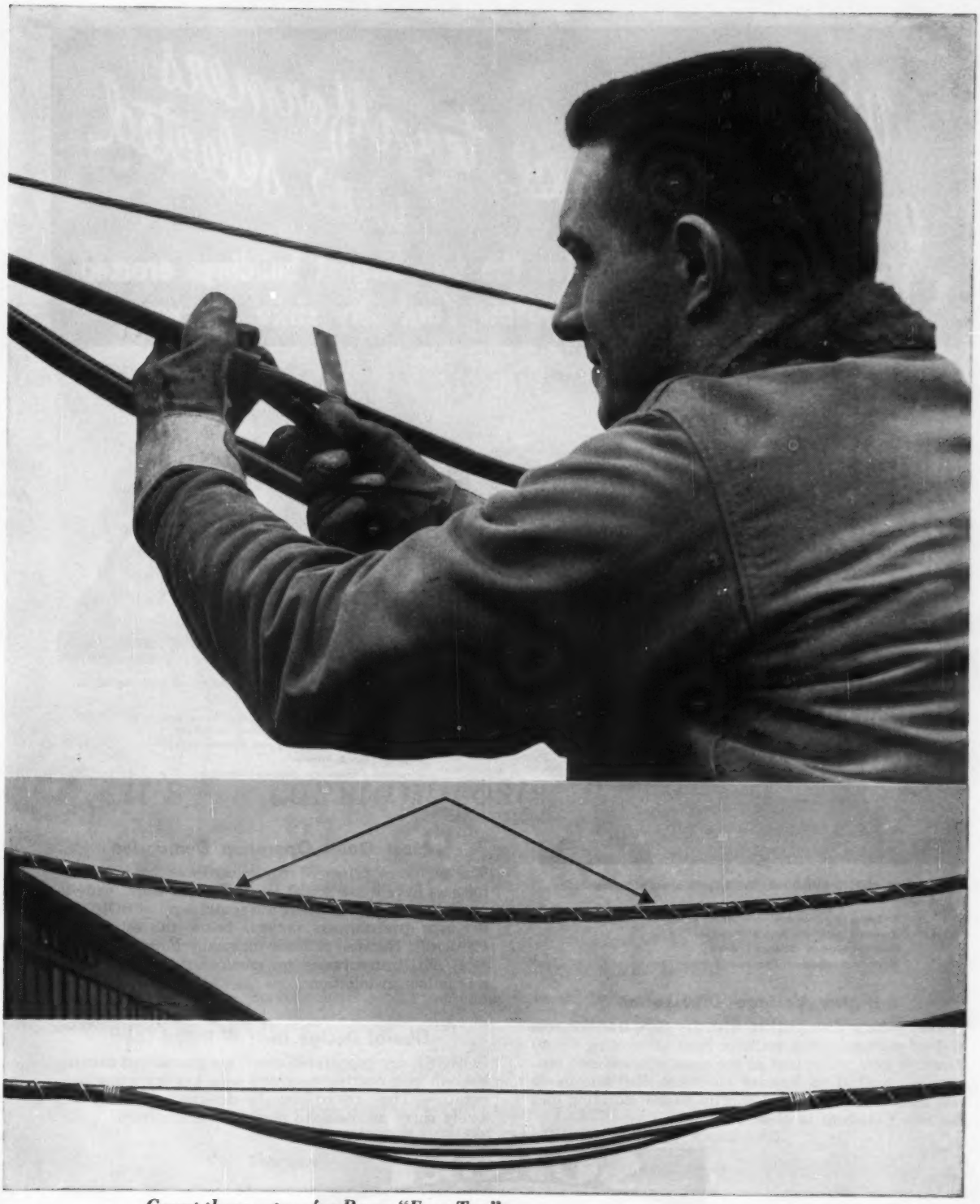

Count these extras for Rome "Easy-Tap"

1. High resistance to storms, weathering and environmental hazards . . . means long life, lower maintenance cost.
2. Elimination of tension on conductors . . . permits proper tensioning and sag of the messenger.
3. Provides greater reliability of service than open wire circuits . . . increased strength against ice and wind loading.
4. Enables making of mid-span taps . . . relieving congestion at poles and improving appearance.
5. Resistance to tree abrasion . . . minimizes tree trimming expense and eliminates need for overlength poles to clear trees.

Why Sorgel dry-type transformers were selected

for the two largest buildings erected in New York City since the war

SOCONY MOBIL BUILDING, the largest air-conditioned office building in the world.

Architects: Harrison & Abramovitz.
Associate Architect: John B. Peterkin.
Electrical Engineer: Edward E. Ashley.
Electrical Contractors: Fischbach & Moore, Inc.

Higher Voltage Distribution

Higher voltage distribution, with dry-type transformers at load centers, which we have been advocating for 40 years, is now recognized as the most efficient and economical method of interior electrical distribution. It has been adopted for the Socony Mobil Building and the new Coliseum in New York City.

NEW YORK COLISEUM, the largest exhibition building of its kind in the world.

Architects: Leon and Lionel Levy, with Aymar Embury II, Otto Eggers of Eggers & Higgins, and John B. Peterkin, as a consulting and advisory committee.
Engineer: Guy B. Panero.
Electrical Contractors: Jackson-Livingston.

Most Quiet Operation Demanded

The engineers' principal requirement was that the transformers have a low sound level. Regular tests, made in our laboratory, prove that the sound level of SORGEL dry-type transformers is well below the established standards. Because of their unusually quiet operation, SORGEL transformers are particularly adaptable for any indoor installations.

Liberal Design for Full Rated Load

SORGEL dry-type transformers are guaranteed to carry the full load continuously at a safe, low operating temperature. They are so liberally designed that they can safely carry an overload during an emergency.

SORGEL TRANSFORMERS

Tested and approved by Underwriters' Laboratories under the Re-examination Service

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wisconsin

Sales Engineers in Principal Cities

under the boiler in a steam plant...

it's constant-costs that count!

Be Thrifty! Expensive boiler installations designed to burn fuels with limited futures is doubtful wisdom. The sensible alternative is to *bank on Bituminous!* Plotting your costs over the long run will prove efficiency and lowest cost in most cases. For, Bituminous reserves are unlimited—they're nearest to most manufacturers—coal technology improves burning equipment, efficiency and cost year by year.

Let our Coal Technical Service plot a constant-low-cost Bituminous coal for your needs. *Ask our man!*

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BITUMINOUS COALS FOR EVERY PURPOSE

MOLONEY'S NEW VALVE DRAINS TRANSFORMERS...*THOROUGHLY*

All the oil drains out freely with Moloney's new valve because the valve's seat is ⅛ inch below the transformer tank's bottom. This assures removal of sludge and sediment from the tank bottom, and because such sediment is removed, filtered oil remains clean and pure when replaced in transformers.

But that's not all. Moloney's *compact* new valve actually requires less floor space than formerly. Leaky pipe threads are eliminated too, because the new drain valve *bolts* to a heavy flange, and it's sealed to the flange by a corprene gasket that's confined in a gasket retaining groove. In addition, the nylon-brass valve seat makes a postive seal, preventing oil leaks. The sampling valve, mounted high, has free access and plenty of space for the sampling cup. The sampling valve operates only when the drain valve is open.

Moloney's new drain valve is another reason why Moloney Transformers are better than ever . . . for your utility system.

MEDO-14

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers Industrial Dry Type Transformers • Capacitors • Magnetic Components For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Bennion Retires From EEI

Members of Edison Electric Institute meeting in Atlantic City last week honored Col H. S. Bennion who retired June 1 as managing director and vice president of that organization. For nearly 30 years Bennion had diligently served electric company associations. He had been managing director and vice president of EEI since 1939, a position which became the top staff job in 1946.

During this career of devoted service, Bennion's wise counsel contributed greatly to many coordinated industry efforts. Under his guidance EEI made giant strides in restoring the industry's prestige and enhancing its standing among American enterprise. Bennion became so much a part of the industry and EEI that his own contributions may best be measured in terms of industry and EEI progress during his tenure.

At the time Bennion became assistant managing director of EEI at its founding in 1933, the industry's reputation stood at a low ebb. The predecessor National Electric Light Association had been dissolved following sweeping federal investigations that stirred public feeling against much of the industry.

From this inauspicious beginning, EEI has grown into one of the leading industry associations of today. Bennion, in his quiet, firm manner, helped to build a competent, dependable organization serving the industry and the public. And with this service came an enviable reputation.

Today Congressional committees seek EEI's advice and counsel on a host of matters ranging from atomic energy to taxes. Leading newspapers and magazines look to EEI as spokesman for the entire privately owned electric industry. The annual convention attracts as much news coverage as any other annual meeting of comparable size and importance.

Both the industry and the public have come to look to EEI for authoritative industry statistics and other information. The organization is proud that it does "a large business in facts." These statistics, power surveys, and other information are used by utilities and others as a basis for short and long-range planning.

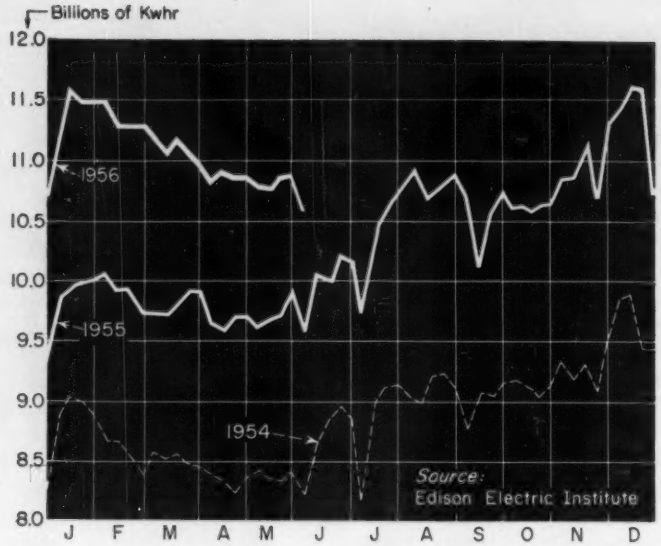
EEI provides for the utility industry a service vehicle for exchanging and sharing the latest technical and commercial techniques. Research projects, under EEI sponsorship, delve into unsolved industry problems. The bulk of the staff work is directly related to the managerial, engineering, commercial, and accounting committees which form the basic organization.

During World War II and the Korean action, EEI helped coordinate efforts of the utilities to serve rapidly expanding wartime loads in the face of severe material and equipment shortages.

Colonel Bennion would be the last to claim individual credit for the scores of activities and special projects undertaken by EEI, but his sound direction, wise counsel, and extensive knowledge of the industry made many of them possible. The honor which EEI members paid Bennion during the meeting could be no more than a token tribute for a lifetime of conscientious service.

ELECTRICAL WEEK

LAST MINUTE



OUTPUT

Week ended June 2
10,598,000,000 Kwhr
Up 11.1%

Atomic Energy Commission requirements — 1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 8.5%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
June 2	+11.1	+8.1	+6.4	+15.1	+10.2	+9.7	+17.2	+11.2	+12.2	+7.3
May 26	+9.5	+7.3	+2.6	+13.0	+8.4	+9.4	+14.4	+13.5	+10.6	+7.5
May 19	+11.8	+11.3	+7.7	+16.9	+9.3	+11.0	+14.1	+12.3	+12.3	+5.3

Seasonally Adjusted Index 214.5 Week Ago 214.1 Year Ago 196.1

Issue's Highlights . . . Washington Water Power wins Coffin Award for advancing private enterprise philosophy; Stevens County election cited . . . Edison Electric Institute names new officers, presents awards at annual meeting . . . Fred A. Seaton gets Senate approval as new Secretary of Interior . . . David A. Hamil is nominated as new head of REA . . . First pile goes critical at Britain's Calder Hall nuclear power plant . . . Utility Workers Union of America opposes Senator Gore's bill for six government-built reactors.

Arthur Kline, a Wyoming state judge, is nominated by President Eisenhower to a five-year term on Federal Power Commission. If approved by Senate, the 47-year-old Republican will succeed Claude L. Draper, another Republican who retires June 22 after 26 years on the Commission.

Six utilities join Electric Companies' Public Information Program to boost total membership to 75 companies. New members are: Consolidated Edison of N. Y., Portland General Electric, Georgia Power, Lake Superior Power, Central Power & Light, and Western Massachusetts Electric . . . **Carl J. Forsberg, president of Wisconsin Power & Light, is re-elected chairman** of PIP Steering Committee. Howard Melvin, executive vice president of Atlantic City Electric, is named chairman of PIP Finance Committee.

Electric companies move toward assuming full responsibility for development of all feasible nuclear power reactor types once they are out of prototype stage. Acting on recommendations of its Atomic Power Committee, EEI's board of directors **(1) sets up a Technical Appraisal Task Force** on atomic reactors to select reactor designs that merit development and construction; **(2) calls conference** of member companies' presidents to review atomic program in U.S. and role of power companies in it; and **(3) authorizes appointment** of full-time executive secretary for Atomic Power Committee.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . Atomic Energy Commission contributes $350,000 toward cost of research reactor for Spanish government. General Electric will supply the 3,000-kw pool-type unit . . . On June 25 at Pendleton, Ore., **Federal Power Commission begins hearings** on Pacific Northwest Power Co's application for proposed Mountain Sheep-Pleasant Valley hydro projects. Later hearings are slated for Lewiston, Ida., and Washington, D. C.

Potomac Electric Power rejects highest bid of 100.799% for $10-million 3⅜% first mortgage bonds (Aa) due 1991 by Lee Higginson and associates because "group's papers were not filled in sufficiently and properly." **Pepco accepts second bid** of 100.38% for 3⅜% bonds by Harriman Ripley group. Underwriters reoffer bonds at 101.094% to yield 3.57%. Pepco also offers holders right to buy 281,435 common shares at $20.25 (yield 5.43%) on 1-for-20 basis, record June 5 to expire June 20.

Halsey Stuart & Co group wins $40-million Commonwealth Ed 3½% first mortgage bonds (Aaa) due 1986 at 99.43%; reoffers at par to yield 3.50% . . . **Delaware P&L offers holders** right to buy 232,520 common shares at $35 (yield 4.57%) on 1-for-8 basis, record June 6 to expire June 26. DP&L will offer employees up to 150 shares each. Carl M. Loeb Rhoades group wins bid to underwrite the issue with compensation of 13.899¢ a share . . . Putnam & Co and Chas. W. Scranton & Co offer 104,000 of 4.50% $50 par cum **preferred shares of Connecticut Power** at $50 a share to yield 4.50%.

Yankee Atomic Electric and AEC sign first contract made under AEC's power demonstration reactor program. Under the agreement, AEC grants Yankee $5 million in research and development funds, and waives charges for use of nuclear material to fuel the reactor for five years.

Hydro capability of Columbia River Federal System is cut 818,000 kw because of high tailrace waters at dams in the flooding valley, Bonneville Power Administration reports. It appeared last week that interruptible loads of some industrial customers may have to be dropped because of peak shavings, but BPA said there was no danger of firm loads being affected.

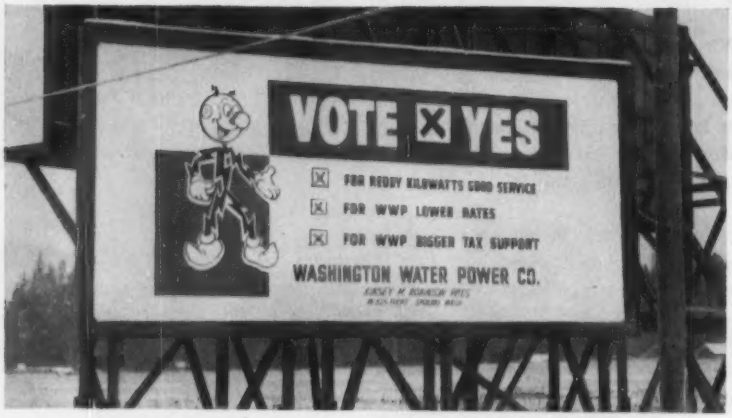
ABOUT PEOPLE IN THE INDUSTRY

"It won't be too long before we'll be in the market for another unit," declares Major Thomas H. Allen, president of Light, Gas & Water Commission of Memphis, Tenn. Three 250,000-kw units are already ordered for city's power plant; three more can be added. "Everything's growing," says Major Allen, who discloses that peak load of Memphis jumped from 304,000-kw in summer of 1954 to 381,000-kw in 1955—about 25%.

President Eisenhower nominates Dr Willard Frank Libby for reappointment to five-year term as member of Atomic Energy Commission. Principally a scientific and technical member of AEC, he was first appointed in September 1954 to finish unexpired term of Dr Henry D. Smythe. Dr Libby served previously as professor in department of chemistry at University of Chicago's Institute for Nuclear Studies.

More News About People page 200

WWP Named Coffin Award Winner



Billboards marked WWP campaign in Stevens County . . .

where vote count showed that 72% favored utility . . .

and WWP gave check to PUD head (l) for county system

Cited for efforts to advance private enterprise philosophy and campaign in Stevens County victory over PUD

For continuing efforts to advance the private enterprise philosophy and for unusual achievement in winning acceptance in the Stevens County, Wash., election, Washington Water Power Co last week received the coveted Charles A. Coffin award.

The award was presented at the Edison Electric Institute's 24th annual meeting in Atlantic City.

It was the fourth time that Kinsey M. Robinson, president of WWP, has led a company to win the industry's highest annual honorary symbol of achievement. Twice before, in 1940 and 1950, WWP under Robinson achieved this honor. And in 1936 it was won by Idaho Power Co when Robinson headed that company.

Blow Struck for Private Power

This year's presentation specifically recognized the successful campaign which WWP waged among the voters in Stevens County last fall. As a result, a 72% majority voted to sell the county's PUD properties to WWP. And the election was generally hailed as a resounding victory for private power.

In receiving this year's Coffin award on behalf of his company, Robinson commented:

"The American people basically are firm believers in our system and philosophy of private enterprise and, in spite of the small but extremely vocal group of radical politicians and others, the voters will support free enterprise if presented with all of the facts involved and given an opportunity to express themselves. Employees of Washington Water Power have proved again, if any of us is doubtful, that supporters of private enterprise should take a firm stand in the principles of American liberty, rather than avoid these important issues that some day may destroy us."

EEI Praises Utility

Consisting of a gold medal for the winning company, and $1,000 for the employees' benefit fund, the Coffin award is presented annually in recog-

nition of outstanding achievements by electric companies. It was presented to Robinson by Ralph J. Cordiner, president of General Electric Co.

In announcing the award, EEI praised the Washington company for:

1. "An unwavering determination on the part of company officials and employees to survive in the face of a destructive public utility district law, federal encroachment into the field of private enterprise, and a trend of the federal government to dominate and control power resources in the Pacific Northwest.

2. "Voluntary and extraordinary efforts on the part of company employees by way of preparatory training to acquaint themselves with their discouraging situation, making plans for policy changes to improve service to customers, creating communication channels such as a free enterprise film library and speakers' bureau, extensive personal contacts by both union and non-union employees, and participation in numerous community endeavors by all employees as good citizens.

3. "Effective execution of the company's practical public relations program, demonstrating exceptional loyalty and resourcefulness on the part of employees, the effect of which was improved public relations in all parts of the company's service area."

Judges in the final competition for the Coffin award were Dr James R. Killian, president, Massachusetts Institute of Technology; C. W. Kellogg, past president of the Edison Electric Institute; and Harllee Branch, Jr, president of EEI and also president of Georgia Power Co.

EEI Meet Sets Busy Pace

The 24th annual Edison Electric Institute convention meeting in Atlantic City last week set a busy pace. Highlights of the three-day session, which drew more than 3,000 persons, were these:

- Donald S. Kennedy, president, Oklahoma Gas & Electric Co, moved up to become the new EEI president, succeeding Harllee Branch, Jr, president, Georgia Power Co.
- Edwin Vennard officially took over as managing director of the Institute, replacing Col H. S. Bennion who retired after 30 years of service with utility associations (see page 102).
- J. Wesley McAfee, president, Union Electric Co, became new vice president of EEI, replacing Kennedy in that position.
- Charles A. Coffin award was presented to Washington Water Power Co for "extraordinary and enlightened leadership in a struggle for survival of free enterprise in the electric industry."

- Reddy Kilowatt annual report top award went to American Gas & Electric Co for taking full advantage of the report to inform stockholders and the general public about contemporary trends, for doing a good job selling its service, for comparing company performance with the industry as a whole, and for interesting writing. Class A award went to Philadelphia Electric Co; Class B, to Dayton Power & Light Co; Class C, to Interstate Power Co of Dubuque, Iowa; and Class D, to Nova Scotia Light & Power Co.
- Fifteen major addresses, relating to a host of industry achievements and problems, were presented.

Kennedy, a Hoosier by birth but an Oklahoman by conviction, took over as chief executive of EEI at the closing session Wednesday afternoon. In his new position, Kennedy becomes spokesman for the association and will guide its policy-making functions. He succeeds Branch who has been one of the most active EEI presidents in years. McAfee, who was named the new vice president, becomes heir-apparent for the top position upon expiration of Kennedy's one-year term.

Vennard, former president of Middle West Service Co, became a vice president of the Institute March 1. He assumed the post of managing director last week upon the departure of Bennion. Bennion had served in that position since 1939 and has been the top staff executive in EEI since 1946 when the organization discontinued the post of a full-time, paid president.

Highway Bill Provides Relocation Repayment

Utilities have won a major victory in their fight to have the federal government reimburse them for relocation costs made necessary by highway improvements on federal-aid systems. The big $50-billion highway program now on its way to final enactment provides federal reimbursement for utility relocation costs.

This federal repayment to utilities for relocation expense is applicable in any state that provides for reimbursement under state law. About three states now have such laws, and the remaining states are expected to enact similar legislation after the new federal program takes effect.

House and Senate versions of the highway bill agreed that the federal share of the reimbursement should be in the same ratio as the federal contribution to the project: 90% for interstate highways and 50% for other federal-aid roads.

Only limitation was one retained in the bill as passed by the Senate, that utility relocation expenditures could not exceed 2% of the total cost of the project. This restriction, which was not contained in the House version, might affect some urban jobs, where relocation cost could be heavy.

House-Senate conferees are deciding whether the 2% limitation should be kept in the bill. There was a good possibility that it might be removed.

Plan Rocky Reach Units

Seven 90,000-kw generators, and provision for four more units are planned for Chelan County (Wash.) Public Utility District's proposed Rocky Reach Dam. The PUD recently got state water-right permit for the Columbia River project above Wenatchee.

Utility Workers Score Gore Bill

. . . before joint Congressional committee which hears testimony on proposal for six government atomic power reactors

The Utility Workers Union of America, AFL-CIO, is firmly opposed to the government building and operating additional atomic power reactors.

This was revealed at the close of hearings by the Joint Congressional Atomic Energy Committee on S 2725, the bill sponsored by Sen Albert Gore (D-Tenn.) which calls for the government to build six nuclear power reactors.

A. I. McMahon, UWUA local president, told the committee, "Frankly, the Gore bill is but another effort to put the government into the business of generating and distributing electric energy and we are unalterably opposed to it."

McMahon noted that the bill is of interest to the "millions of unionized wage earners in the U. S. who presently have the highest living standards in the history of mankind." These gains were obtained by collective bargaining, he said. "No collective bargaining could ever have gotten anything comparable from a government or governmental agency," he added.

McMahon's testimony was in sharp contrast to that of Walter Reuther, president of United Automobile Workers, AFL-CIO, and vice president of AFL-CIO. Reuther urged adoption of the Gore bill because "our atomic power program is shockingly inadequate" compared with the Russians.

McMahon, reminded by Committee Chairman Clinton P. Anderson (D-N.M.) of Reuther's stand, commented, "Reuther may speak for the auto workers but he does not speak for the utility workers."

Other closing witnesses at the hearings were John Jay Hopkins, president and chairman of General Dynamics Corp; James G. Patton of National Farmers Union; and William A. Mills, executive vice president of the Empire State Chamber of Commerce.

Hopkins urged joint government-industry efforts to construct abroad by 1960 as many as 50 atomic power reactors. These would have electric generating capacity of up to 20,000 kw each. He warned that a threat exists that the U. S. might lose out entirely on international atomic energy markets.

Patton not only favored adoption of the Gore measure but recommended amendments to the bill to broaden the Atomic Energy Commission's scope to permit the agency to generate atomic power not incidental to research and to build transmission lines where needed.

Mills charged that the bill would create "not just one more but six so-called little Tennessee Valley Authorities."

The joint committee is expected to meet June 13 to consider further action on this subject.

Utility Poles Topple in Wisconsin Wind and Hail Storm

A fast line squall recently toppled poles like ten pins in a champion's alley along Highway 76 at Stephensville, Wis., blocking traffic for several hours.

Electric service was expected to be restored within 24 hours after the storm struck with its devastating combination of high winds and driving hail and rain. The hard-hit Stephensville area is about 12 miles northeast of Appleton in the mid-eastern section of the state.

Seaton Approved for Interior

Senate okays Eisenhower's nomination of Nebraska publisher as new Interior Secretary, succeeding McKay

Fred A. Seaton, recently nominated by President Eisenhower as new Secretary of the Interior, has been approved by the Senate. He is predicted to be a prime asset to the Republicans this fall when it comes to fighting for issues that count in the West.

Seaton, Nebraska publisher and early Eisenhower backer, was chosen by the President over Nebraska's Clarence A. Davis, Interior undersecretary. Davis was openly backed by more than a dozen Republican senators from the West and Mid-west.

Eisenhower's decision to pick Seaton is universally figured to be a master stroke to blunt attempts by the Democrats to make the "Republican give-away" and "public vs. private power" key issues in the West.

At the outset, even the most public-power minded Democrats, including Sens Wayne Morse and Richard Neuberger of Oregon, praised the President's nominee, and predicted quick Senate approval.

Seaton has a number of factors in his favor. Among them:

1. Previous Senate membership, an almost 100% guarantee of approval for any appointive post requiring Senate approval. Seaton was the appointed successor of the late Sen Kenneth Wherry in 1951-52.

2. Absence of direct connection with the McKay regime at Interior, which has been attacked by Democrats. Davis is regarded as a strong McKay backer. Some Democrats immediately concluded that Eisenhower's rejection of Davis means "a rejection of the McKay policies."

3. He is a westerner, publisher, and Republican of many years standing. He's had experience in Washington these past three years at Department of Defense and the White House—in each job dealing with problems of Congress. This means he is politically acute to what pleases and displeases the congressmen and his constituent.

4. His statement that he isn't sure if he will carry out any specific McKay policies, but that he is going to continue Eisenhower's power and water plans, including the partnership policy.

Seaton won't get by without a token squabble, however. Democrats see his appointment as giving them a chance to give Senator Morse a lift against McKay in the Oregon race this fall.

Democratic National Chairman Paul Butler has volunteered questions that point up the Democratic approach. He asked if the Administration will:

1. Keep supporting big power companies at Hells Canyon, John Day, and in Tennessee Valley Authority?

2. Stop attacking public preference clause on sales of power from federally-developed projects?

3. Support public development of Niagara power?

New REA Chief Named

Eisenhower nominates Colorado General Assembly Speaker David A. Hamil as Ancher Nelsen's successor

David A. Hamil, speaker of Colorado's General Assembly since 1951, has been named chief of Rural Electrification Administration by President Eisenhower. Subject to Senate confirmation, Hamil would succeed Ancher Nelsen, who resigned recently.

In accepting the REA post, Hamil said he planned no immediate changes in REA policies and intended to "follow the program as laid out by Ancher Nelsen until I get my feet on the ground. . . . There are no strings on me." He continued, "My obligation in accepting the job is to give fair and impartial treatment to all."

Hamil, a former incorporator and director of Highline Electric Association, Colo., takes over at REA with most major problems out of the way. Since this is an election year, it is expected there will be cautious application of Eisenhower's power policies until the people have voiced support.

As he steps into the job, Hamil's problems will be of the long range variety. For instance, REA borrowers currently are in as good a financial position as they have ever been. It is going to be a challenge to Hamil to maintain this situation in the face of heavier amortization schedules.

REA is in excellent shape with regard to funds. If the $244-million appropriation for the 1957 electric program is approved as expected, there will be more than sufficient funds to meet loan requirements.

Again on the long-term basis is the question of how REA will approach borrowers' proposals for making and supplying power. This involves growing demands for power from users.

Nelsen, before leaving, made the Brazos Electric Co-op loan of $7.5 million for a generating plant. No similar requests are outstanding. But Hamil will have to pass on the loan request of Wolverine Electric Co-op to build a nuclear power reactor. This should be routine as the commitment has virtually been made.

TVA Financing Plan Scored

Sen Karl Mundt says TVA has run roughshod over Senate in pushing plan to finance additions with power revenues

Tennessee Valley Authority has drawn sharp criticism for its efforts to gain authority to build new units out of its power revenues.

Sen Karl Mundt (R-S.D.) accused TVA of having "been able to intimidate the House" in gaining House approval for this course. But, said Mundt, the Senate still believes Congress controls the purse strings.

The criticism was made at subcommittee hearings on supplemental appropriations for TVA for 1957. The Senate position is that TVA can build additions but not new plants with power revenues.

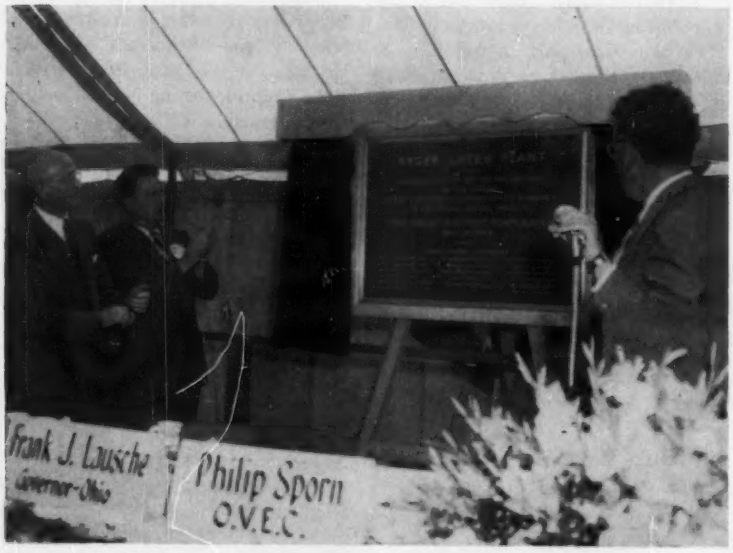
What is the reason, Mundt asked TVA Chairman Herbert D. Vogel, TVA "shows such contempt for the position the Senate has taken?" The agency, he added, persists "in riding roughshod over the Senate."

Vogel told the subcommittee that in any event TVA will not be able to meet its future power needs from its own power revenues. He urged legislation to permit TVA to sell revenue bonds because "it sets us up for the long range basis."

At another appropriation subcommittee hearing on funds for the Southwestern Power Administration, Warren L. Porter, vice president, Kansas City Power & Light Co, accused SPA of seeking a "federal power empire in the Southwest."

Porter, speaking for 12 southwestern electric companies, recommended that the SPA request for $6.2 million for its continuing fund be denied. The money would, in effect, be subsidizing a $3-to $4-million-a-year loss by SPA. Electric companies in the area "will be confronted with the destructive competition of subsidized power and the possibility of demands for its expansion," Porter remarked.

The executive also told the subcommittee that SPA's attempts to amend its contracts with G&T's to provide for payments on a net balance basis was a "device which would permit SPA to finance steam generating capacity from power revenues without Congressional approval or control."



PLAQUE UNVEILED by Ohio's Governor Lausche as AG&E's Philip Sporn (left) and West Virginia's Gov William C. Marland look on at OVEC dedication ceremonies

Governors Dedicate OVEC Plants

Ohio Valley Electric Corp's generating plants, totaling 2,365,000 kw, were "dedicated to the service and defense of this nation" at twin celebrations recently.

At the 1,290,000-kw Clifty Creek plant in Madison, Ind., Gov George N. Craig of Indiana unveiled the plaque before some 700 guests. And Ohio Gov Frank J. Lausche later drew the curtain from a similar plaque at the 1,075,000-kw Kyger Creek plant before about 1,200 people.

Both governors welcomed OVEC for the industrial development it can bring to the Ohio Valley and the opportunities it offers the people. Gov Lausche, in addition, stressed the advantage the valley has in natural resources.

Philip Sporn, president of OVEC and of American Gas & Electric Co, said the two plants already have supplied some 2-million kw to the Atomic Energy Commission's Portsmouth Project. Despite taxes in excess of $2-million, he stated, the power rate is now under the original quotation of 3.85 mills per kwhr.

Transformer Failure Drops Chief Joseph Hydro Plant

Failure of one 103-Mva single-phase transformer in the 13.2-230-kv main bank at Chief Joseph hydroelectric plant May 29 cut 260 Mw generation from the Pacific Northwest power interconnection. U. S. Army Engineers said there was no system disturbance and full generation was restored in 27 hours by installing a spare transformer.

The loss of capacity caused no hardship, according to Bonneville Power Administration, because system load was light during the pre-holiday industrial slowdown and warm weather. Flooding of the Columbia River had also curtailed some industrial load.

Failure is believed to have occurred between the high- and low-voltage windings of the water-cooled transformer. Even after untanking, engineers still "don't know what happened," according to U. S. Engineers, but the failure came within the manufacturer's guarantee period. English Electric Co engineers are participating in investigations and will ship the unit to the company's St. Catharines, Ont., plant for repair.

Calder Hall Begins Operation

First pile at Britain's atomic power installation starts work; Queen to perform formal opening ceremonies in October

Britain's first of two atomic piles at its Atomic Energy Authority's Calder Hall atomic power station in Cumberland went into operation recently. The station will be the first in the world to supply electricity on a large scale from nuclear sources when dispersion of the power begins in a few weeks.

The formal opening ceremony will be performed by Queen Elizabeth on Oct. 17 when, according to an AEA statement, "for the first time in the history of the world, electricity on a large scale will be supplied from a nuclear power station to a national electricity network."

Tests to Precede Transmission

Although the first pile has started work at Calder Hall, transmission will not begin until further tests have been made. The first town to receive atomic electricity in Britain will be Whitehaven, where in a few weeks atomic electricity will go into grid system and be dispersed over north-west area.

Calder Hall, part of AEA's program for power stations, and recently called one of the seven wonders of Great Britain, is a $42-million project. It is regarded as the prototype of others which experts have predicted will have an "incalculable effect" on the country's industry and economy. It has been estimated that when Calder Hall is in full production, the cost of generating electricity in an atomic power station will be about equal to that of a normal coal-burning station.

Uranium Loading Begins Start-Up

First important step in the station's start-up occurred when sufficient uranium had been loaded for the chain reaction to take place and for the first pile to become self-sustaining, said AEA. Physics measurements and instrument checks will now take place to be followed by the gradual commissioning of the plant.

About a month after the delicate operation of loading the uranium fuel elements in the reactor's core started, the critical stage was reached. Then, from a state of negative activity, the reactor slowly became divergent.

The reactor will be run at a low-power level for some time, but with increased activity a considerable amount of heat will be generated. This will be extracted from the core by circulating carbon dioxide gas under pressure through it and four steam-raising towers. The steam will drive turbines coupled to two 23,000-kw alternators. Before that stage is reached, however, and while the reactor and its complicated control system are being run up, the steam will be fed into an associated "dump" condenser where the resulting energy will be absorbed.

The station comprises two reactors and generating equipment to supply a total of 92,000 kw of electricity. The second half is expected to be ready for commissioning next spring.

AEA is also building a replica of the first power station on the same site in Cumberland, and another with four reactors at Chapel Cross, near Annan in Dumfries-shire. Both have the dual purpose of producing electricity—they will have a total installed capacity of 368,000 kw—and making plutonium for Britain's military program.

Calder Hall is not included in the national program which plans construction of 12 atomic power stations by electricity authorities during the next ten years at an estimated cost of $840 million.

Ike's Policy Seen Key Issue

. . . in Oregon as voters get set to choose between McKay and Morse for senator in November with focus on power

Eisenhower Administration power policy can be sure to take a big role in Oregon in November when voters decide whether to return newly converted Democratic Senator Wayne L. Morse to the nation's capital or pick former Secretary of the Interior Douglas McKay as their senator.

The two arch political foes captured their parties' nominations handily in the primary balloting recently and thus set the stage for a rough and tumble battle that likely will keep problems of hydroelectric development in the Columbia River basin in the forefront. Investor-owned utilities probably will get bruised in the crossfire.

As one of the principal advocates—if not architects—of the Eisenhower power policy, McKay will be both defender and champion of the viewpoint which conflicts with the public and federal power partisanship of Morse. Ike first spelled out his partnership policy in 1952 at the McNary Dam dedication in the Pacific Northwest.

In the primary balloting, McKay achieved a 23,162 lead with 118,105 votes while his principal rival, Phillip Hitchcock, a Portland College administrative officer and former state senator from Klamath Falls, garnered 94,943. Two other candidates picked up 26,000 votes.

Morse's only opponent was a political unknown, Woody Smith of Hood River. The senator who became a Democrat within the past year polled 191,159; Smith 39,221.

On the GOP presidential preference ballot, Eisenhower drew 221,471 votes. He was the lone candidate on the ballot. In the Democratic preferential voting, the write-in efforts of supporters gave Adlai Stevenson 88,262 and Estes Kefauver 56,899. Both had discussed power policy in campaign appearances in Oregon.

Stevenson had declared at one point that while the idea of partisanship sounded good it just wasn't working out because it was upsetting the schedule of development of the Columbia. In other ways, the Oregon Democratic party showed up its pro-public power viewpoint by electing C. Girard Davidson, former undersecretary of the Interior, as national committeeman, and nominating for U. S. Representative in the 2nd Oregon district, Al Ullman, who has figured in organizations backing a high federal power dam in the Snake River Hells Canyon which is within his district.

EEI Honors Col Howard S. Bennion

Amid glowing tributes from the men he had faithfully served, Col Howard Sharp Bennion last week ended a 30-year career in electric company associations. He had officially retired as managing director and vice president of Edison Electric Institute June 1, but the leave-taking came during the 24th annual EEI convention in Atlantic City last week.

Institute members honored Bennion at a Monday evening reception attended by some 3,000 persons. A more formal tribute came during the Tuesday morning convention session when Louis V. Sutton, president, Carolina Power & Light Co, delivered an address of appreciation on behalf of all Institute members.

A distinguished career behind him, Colonel and Mrs. Bennion departed late in the week for a two-month tour of Europe with a stop or two in the Near East. Their summer trip will take them to 12 countries. Bennion has set aside a week to attend the World Power Conference meeting in Vienna, Austria, June 17.

Upon return to the United States, Colonel and Mrs. Bennion will make their home in Salt Lake City, Utah. For Mrs. Bennion this will be a dream come true. She will be returning to her native city and her many friends there. The colonel is a native of Vernon, Utah.

Bennion has no firm plans for work after his return. "After 48-and-a-half years of work and the busy trip abroad, the first thing I want to do is rest," Bennion said recently.

In the industry's farewell to Bennion, Sutton had this to say of the colonel's service:

"His has been the unifying, vivifying, directing influence. He has furnished the channels of communications through which the best thought and practice of the industry was transmitted to all of its members. He has been the wise, unresting, and wholly honorable leader in our common fight against the insidious dangers of public ownership.

"A man of the highest instincts and practices of probity, he has insisted at all times that the only effective answer to error is the truth. Let us never forget that at no time has any information circulated by the Edison Electric Institute been proven to be false. When Colonel Bennion has spoken or written against improvident or deceptive public proposals, his attacks have been devastating in their effects because he has brought to every discussion a masterly command of the true facts and a high, and wholly American, concept of sound democratic policy."

What's Ahead for the Industry:

- **Power utilization is ripest for engineering exploration by the industry**
- **Engineering must be kept ahead of promotion in the adequate wiring field**
- **Inter-industry exchange of engineers would be profitable to all concerned**
- **Foresees 20-year struggle to remove discriminatory power legislation**

What are the electric utility industry's pressing problems? Where should its efforts be concentrated? Col H. S. Bennion, just prior to his departure from the top staff EEI post, offered these observations:

"The industry must continue to go forward on all fronts, providing the service and the leadership that is the basis of its public acceptance. This calls for continued concentration on technical progress with particular emphasis on the utilization of electric power. It means expanded efforts to secure and train the kind of personnel needed to man our industry, and it means providing incentives to retain such personnel.

"The industry must persist in its pleadings before the committees of Congress to amend the federal statutes freeing them of discriminatory legislation which puts unfair burdens on company customers. At the same time the industry must continue its earnest efforts to acquaint the American people with the nature of these injustices.

"The vast strides made in advancing the art of generation, transmission, and distribution of electric power will continue. Not only has the industry pioneered in these fields, it has also adapted many advances in related fields to its purposes. Technical progress of this type is vital to the industry's well being. It becomes crucial in the face of rising material, equipment, and labor costs.

"The area ripest for engineering exploration is nearer the point of end use. Although the utility industry does not have a direct responsibility in this area, it, nevertheless, has a large stake in it. Here, utilities must provide leadership and guidance if its customers are to fully share the technical advances which are possible.

"For instance, the industry must know present and future wiring needs before it can offer sound advice on adequate wiring. It is extremely necessary that engineering be kept ahead of promotion in this field.

"Overall, there is the constant danger of letting short range plans interfere with long-range objectives. Lack of vision can be our most costly fault, undermining not only our system planning but also our relations with our customers.

"There are signs that electric companies are now beginning to get the talent they need to carry out their responsibilities. Reports coming into EEI are more optimistic than in some years past. But to insure a continued flow of engineering and other talent into the industry, we must be prepared to offer the incentives that will attract and retain such talent.

Upon His Retirement

Bennion has been vice president and managing director of EEI since June 1939, a position which became the top staff post in 1946. He previously served as assistant general manager and assistant managing director of the Institute. Before that he had served for nearly seven years with the predecessor National Electric Light Association.

For service in World War I, Bennion was awarded the Distinguished Service Medal. This came as a result of his accomplishments in the then new field of military camouflage. He had been selected at the age of 28 to command, organize, and develop for the Army the newly authorized Camouflage Service.

After the Armistice, Bennion was assigned for a brief period to the General Headquarters of the American Expeditionary Forces and was later made district engineer in charge of planning and supervising road rehabilitation in the severely battle-scarred Argonne-St Mihiel areas. For this work he received from France a membership in the Legion of Honor. Poland, then a free country, awarded him the Cross of Valor.

Upon return from France in late 1919 Bennion was assigned to the office of the Chief of Engineers in Washington. He was later assigned by the War Department to duty with the newly organized Federal Power Commission where he served as assistant chief engineer of the Commission.

In September 1924 Bennion was appointed District Engineer of the fourth Mississippi River District at New Orleans, a post he held until he joined the National Electric Light Association in Sept. 1926. He married Miss Marian M. Cannon in 1920.

An Interview with Col Bennion

"The industry must offer full opportunity for a man to develop and use his capabilities. This means rounding out his education, making sure that his duties and responsibilities are equal to his abilities, and providing adequate opportunity for advancement. It is my own opinion that the industry could profit by freer exchange of engineers among companies and among other industries. Not only would such exchanges broaden the opportunities for engineers in the power industry, it would also provide the industry with better-rounded talent to fill managerial positions.

"The utilities should strive to make the most of the engineering talent they have at hand. There is no need for an engineer to handle the work that a skilled artisan could do as well. A man's capacity for growth, his ability to broaden his understanding of the industry, probably is greatest in his first twelve years out of school. Providing opportunities for growth rests squarely with management.

"The power business, by its very nature, is an engineering business. It should provide satisfying work for the engineer. We must make sure that it also offers the opportunities that the talented engineer is seeking.

"Along with these policies, the industry must also take care to rid itself of inadequate personnel. The man who does not fit into utility work should be removed. It may well be a favor to him, causing him to find a position in which he can better serve.

"The industry must continue its long struggle to obtain correction of federal laws which discriminate against electric companies and their customers. These are of such a grievous nature that no amount of excellence on our part can in the long run stand up against them. For the direct benefit of our customers, they must be corrected.

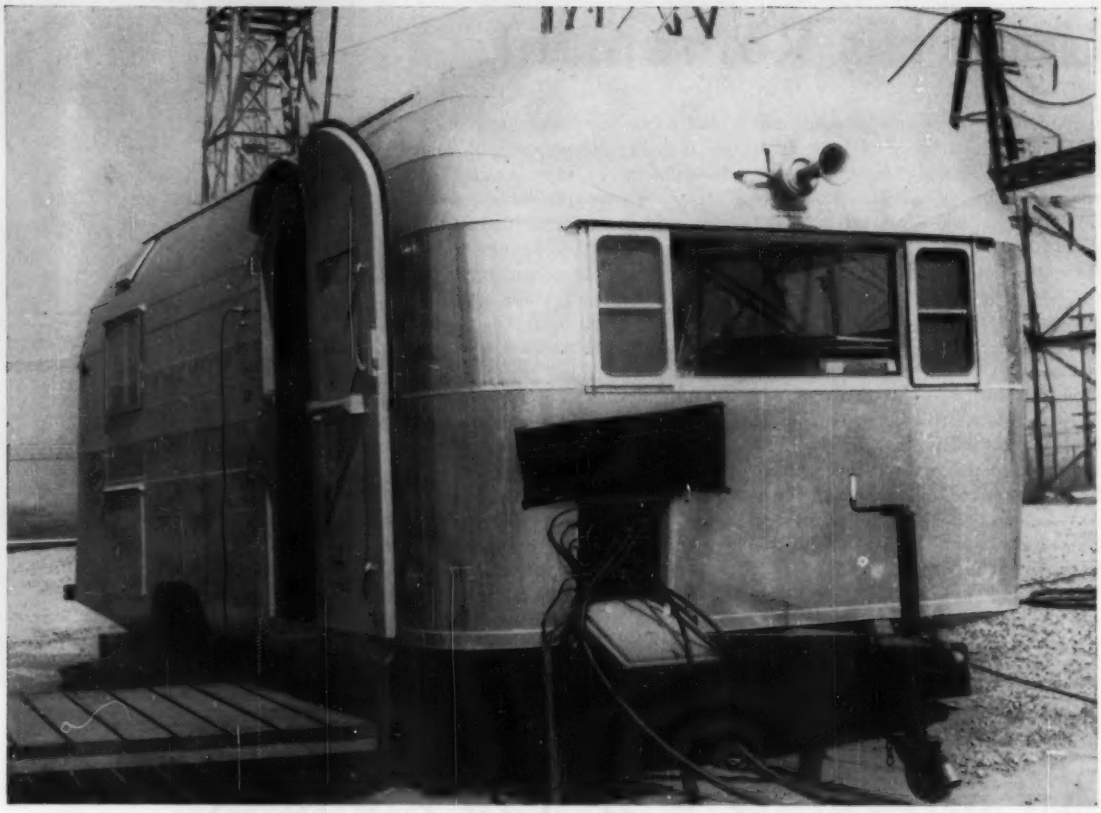
"I refer specifically to taxing practices which makes a heavy levy on electric companies and therefore on their customers while leaving publicly owned utilities virtually free of taxes. Through their electric bills, company customers are paying 25¢ out of every dollar to taxes while customers of preferred groups pay little or nothing for taxes.

"The other serious legislative provision is the unfair preference clause governing disposition of power from federal dams and federal nuclear power plants. If the power were sold at true costs, including its share of the cost of government, the preference clauses would be of no concern. But, disregarding federal statutes, it has been established practice for government agencies to disregard true cost and price power at about half its cost. . . .

"Preference of this type creates a powerful incentive to local bodies to get themselves into the preferred class by voting for local government ownership.

"Taxing practices and preference are most unfair to customers of electric companies and the taxpayer. But even though they are logically and morally indefensible, those who benefit from this special privilege may be expected to squawk to high heaven at any move designed to remove the inequities and treat all power customers alike.

"I foresee long struggles to right these wrongs. Don't be surprised if it takes a couple of decades."



ALL-METAL, LIGHTWEIGHT TRAILER is a control center for testing high-voltage, high-capacity equipment. It combines mobility with flexibility of control of equipment and maximum safety. It has a 15-element oscillograph and darkroom

Test-Control Station Is Mobile

E. E. TUGBY, Engineer, Southern California Edison Co, Los Angeles, Calif.

An expanded program of testing high-voltage, high-capacity electrical equipment at widely separated places has prompted development of a mobile control and oscillographic station by Southern California Edison Co.

The control center combines mobility with flexibility of control of equipment and maximum safety, and includes a complete darkroom. The installation may be placed in service in about 4 hr after the trailer is spotted. The station minimizes outage time for system equipment under test or used for back-up protection.

The station is housed in an all-metal, light-weight, two-wheel 18-ft trailer, purchased without interior fittings. General areas in the trailer comprise oscillography in the front, control panel and desk space in the center, and film processing and darkroom in the rear. Additional built-in wiring in the walls provides four circuits for convenience outlets and lights for the special test equipment. Hatches in the walls cover two terminal boards, one for termination of control cables to equipment under test, and the other for cable connections from equipment under test to the oscillograph.

Mountings Shockproof

The oscillograph is a 15-element magnetic type on a shockproof mounting. It has a daylight-loading film magazine and viewing and scanning screen for monitoring before or during recording. Power is provided by a 12-v battery under the table. Incoming indications are fed to a 15-channel control unit through individual 50-ohm T-pad attenuators to oscillograph elements.

Six channels of the control unit are designed primarily for ac power system studies. Through a selector switch, each channel can be connected to built-in current transformers, built-in potential transformers, or directly to the element through 10-step attenuators. Six other channels connect directly to the attenuators, and may be used with external current or potential transformers, or directly from dc sources.

The remaining three channels have a 50,000-ohm voltage divider between the input terminals and the attenuators. They are designed primarily for dc circuits of a higher voltage than can be accepted directly.

Cables from the equipment under test, which transmit information to the oscillograph, go to a terminal board in the trailer front wall. This board is adjacent to the built-in oscillograph table.

The control panel for oil circuit

breakers has control switches for closing and tripping one "test" and one "back-up" OCB. Red and green indicating lights, connected to operate on 48-v dc or 125-v dc, show circuit breaker positions. A double-throw switch allows selection of either voltage for control power, as Edison uses both voltages at substations.

The test OCB circuit has an overcurrent relay with instantaneous trip attachment for each phase. The instantaneous trip circuit may be cut out individually. The back-up OCB control circuit is arranged for direct control of a circuit breaker, or through auxiliary interposing relays, to isolate trailer control from station control.

During many tests, the back-up breaker actually is an operating unit of the Edison system. Thus, to minimize the chance of stray currents getting into station control wiring, all trailer OCB control connections are isolated from the station switchboard under test conditions. When station OCB's are used for back-up, station relay protection is maintained in service. No relays are provided on the trailer control panel for the back-up OCB.

All switchboard wiring runs to terminal strips to facilitate changes or checking. From the terminal strip, wiring goes to a terminal panel in the trailer wall. Stud-type contacts through this panel provide for external connections for control of equipment under test. Also mounted on the panel are a 12-in. electric clock with long-sweep second hand and ac and dc voltmeters for visual indications or activated circuits.

The darkroom section accommodates an electrically-operated "oscillogram processor" on a work table covering three sides of the area. This self-contained unit processes paper negative strip by the chemical stabilization method. It permits high-speed processing of several hundred feet of record, the operator handling being limited to loading and unloading the magazine. Processing speeds from 2 to 10 fpm are available. Records thus processed may be examined a few minutes after the test. They are sufficiently permanent for most purposes.

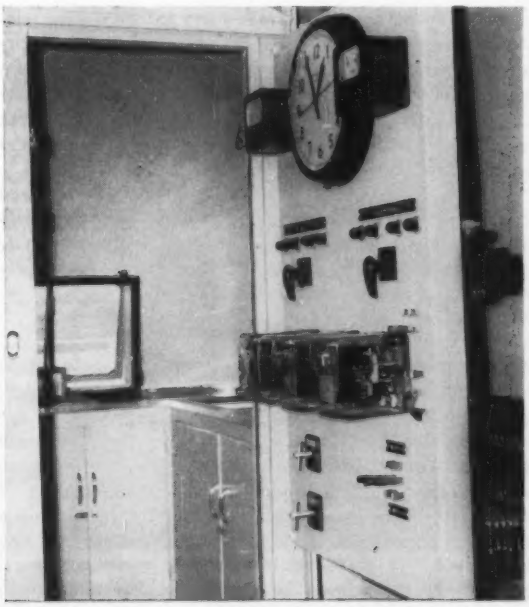
All Metal Grounded

Underneath the work table are cupboards for storing photographic chemicals and equipment. One section is specially fitted to carry bottles of chemicals while in transit. A chemical-resistant sink in another section of the table is used to clean processing equipment after the test. External hose connections under the floor bring in water and carry away drainage.

An electric fan type ventilator in the wall near the developing unit discharges chemical fumes generated during processing. This fan may be light-proofed for handling of light-sensitive material. The sliding door and window in the darkroom have compression type latches and felt linings make joints light-tight.

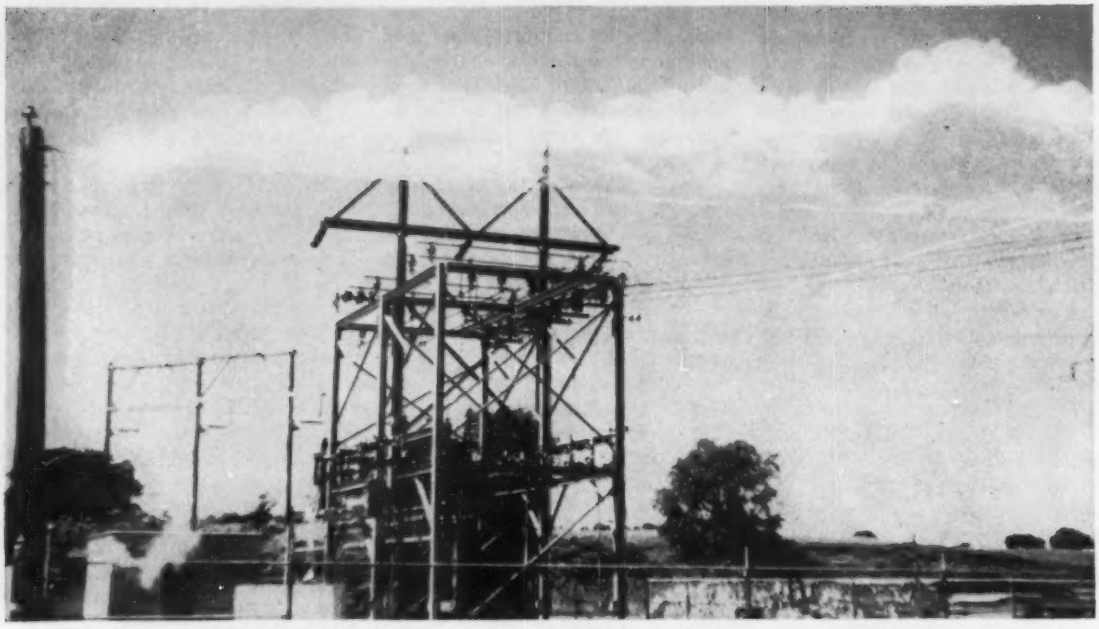
All metal on the trailer is bonded to a common ground point. From here a connection is made to the station ground network when the trailer is used on high-voltage tests. To prevent high-voltage surges from getting into equipment in the trailer, each incoming wire connects to a surge protective gap set with 4-mils-to-ground clearance. These heavy copper gaps are capable of dissipating up to several thousand amperes to ground for a short time. Gaps are mounted in a portable framework in groups of 12 or 18. They usually are located about 30 ft from the trailer. Ground bus of the protective gaps is tied to the station ground network to maintain ground potential level.

A telephone in the trailer has an outside weather-proof connection socket to receive a long extension cord. This cord may be plugged into the nearest convenient outlet of the Edison telephone system. This phone provides direct communication between the trailer and station control room or dispatching office through the Edison phone system.



CONTROL PANEL for oil circuit breakers under test mounts OCB controls, overcurrent relays, indicating lights, etc

OSCILLOGRAPH is magnetic type, 15-element. Film magazine may be loaded in daylight. Power is 12-v battery



SMOKE arises from burning galvanizing on telephone wire during field tests of telephone and power line protective equipment. Heavier current causes incandescent distintegration of the telephone wire as the photo shows dramatically

Explore Coordinated Protection

DISTRIBUTION
Protection

Contact tests indicate criteria for open-wire telephone and power (over 5-kv) facilities sharing same pole lines

JOHN C. SLOTHOWER, Transmission Operating Engineer, Northern States Power Co, Minneapolis, Minn.

A fairly accurate prediction can be made on the performance of coordinated electrical protection on pole lines jointly occupied by open-wire telephone circuits and high-capacity power distribution systems of more than 5-kv to ground.

In predicting protection performance, the initial value of fault current is determined and then used as the first point on a curve of approximate current decay. The rate of current decay is estimated from the relative values of impedance in the power system and of fault resistance in the telephone wire.

Decay Rate Estimated

Usually it is simpler to plot the curve first for maximum decay with the upper portion asymptotic to the value of current which a particular telephone wire can carry safely on a sustained basis. The decay rate is then estimated for the actual conditions, using the relative values of power system impedance and fault resistance. Against this curve coordination with power system reclosers and fuses can be checked.

This method of checking coordinated protection performance was developed in joint tests and studies by engineers of Northern States Power Co and the Bell Telephone System. A special test set-up was established where a 12.5-kv power supply shared pole lines with open-wire telephone facilities.

Under test conditions, power circuits were brought into direct contact with telephone wires. Fault currents were recorded, and their effects on the power system and telephone system protective equipment observed.

Unless certain conditions are met, the National Electrical Safety Code specifies a higher grade of construction (Grade "B") for open-wire telephone and power distribution circuits above 5 kv to ground that are on the same pole line. The code permits joint construction, provided:

1. Power circuits are de-energized upon contact with telephone plant.

2. Voltage and current impressed on telephone plant upon contact with power conductors do not exceed safe operating limits of telephone protective devices.

Back-up Protectors Used

Neither condition is as easily met as might at first appear. The first condition requires that the ground, as applied to the power circuit through the telephone circuit, be of low enough impedance to trip circuit breakers or reclosers or to blow the fuse within a "reasonable" time. That may be anywhere from a few cycles to several seconds or longer, depending upon circuit conditions.

Path to ground for such a fault is

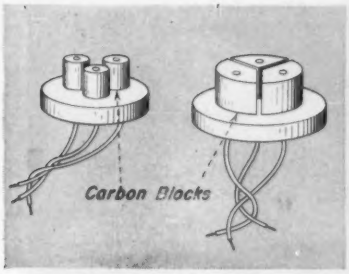


FIG 1—CHARACTERISTICS were improved on protectors after tests

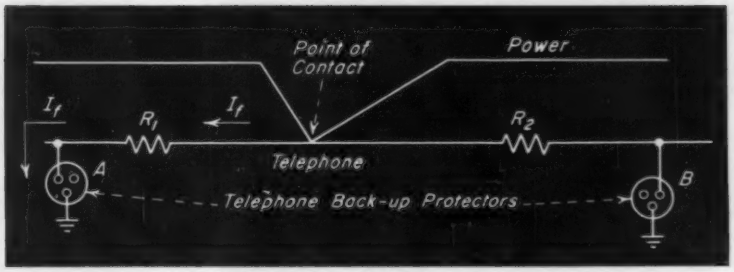


FIG 2—SCHEMATIC DIAGRAM shows how fault current flows through back-up protector or protectors to ground when power and telephone circuits impinge

through the telephone line wire and whatever grounding device the telephone circuit may have. In higher-voltage, joint-use applications, the grounding device is usually a carbon block back-up protector. Such protectors are designed to keep voltage on the telephone plant below safe operating limits, usually 3,000 v. In the event of a power contact, the protectors arc over and maintain the arc until the power circuit potential is removed. This is accomplished by operation of the power circuit protective devices, breaking of the contact, or some other means.

Withstand Duty

As the protector must remain in operating condition throughout the duration of the fault, while carrying all the power fault current, it is a rather rugged device. Tests have established that these protectors can withstand the duty imposed on them even by high-capacity, higher-voltage distribution systems.

Points on the time-current curves (Fig. 5) for several types of telephone back-up protectors, as illustrated, were chosen as just short of the points at which the protectors fail to operate properly. Such curves might be termed "safe operating limit" curves.

As long as the telephone protector remains operative, the fault current should cause the power system protective device—breaker, recloser, or fuse—to operate to de-energize the contact. But there is another variable, the telephone line wire. This wire is a very critical component of the circuit for the following reasons:

1. Initial resistance may be enough to keep fault current below the "pick-up" values of the power system protective device.

2. The wire may fuse at the point of contact thus "de-energizing" the contact, or it may fuse at some other point between the contact and the nearest protector thus interrupting the path to ground and leaving a portion of the telephone plant energized.

3. Even when initial fault resistance of the telephone wire is low enough to allow more than minimum "pick-up" current to flow, the thermal characteristics of steel telephone wire may cause fault current below the "pick-up" value of the recloser or oil circuit breaker before it can operate.

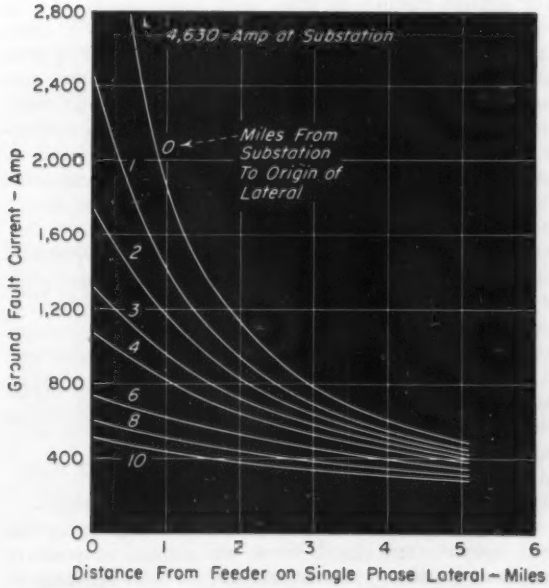


FIG 3—GROUND FAULT CURRENTS plotted are for zero-impedance faults on 12.5-kv feeder and single-phase laterals

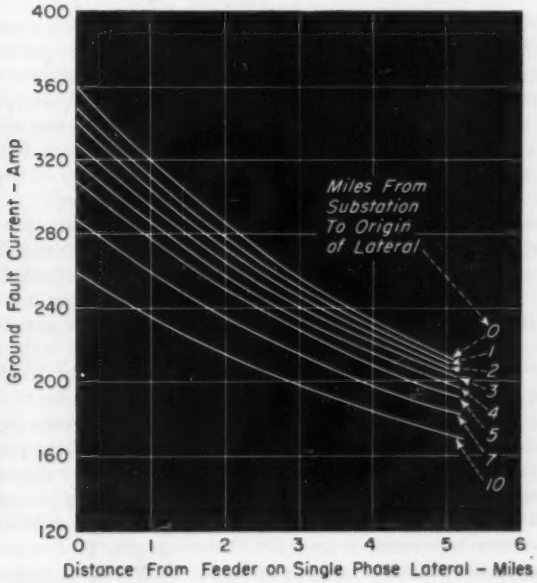


FIG 4—GROUND FAULT CURRENTS for 20-ohm resistance faults on 4/0 copper feeder, No. 6 copper single-phase laterals

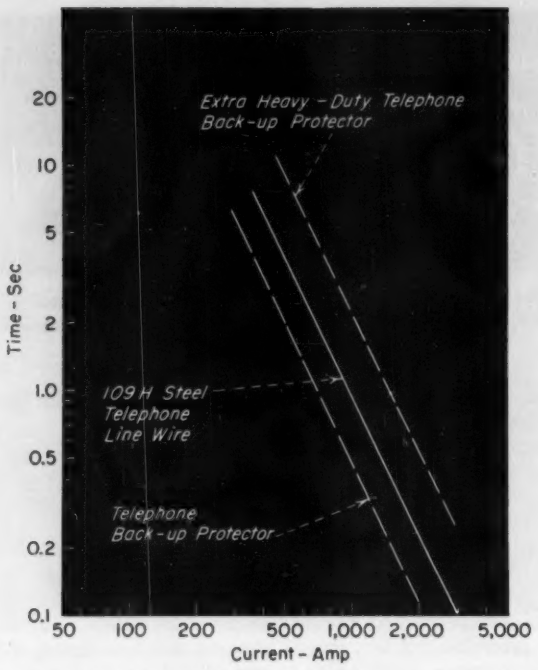


FIG 5—SAFE OPERATING LIMITS of telephone wire and circuit protectors define requirements of a protective system

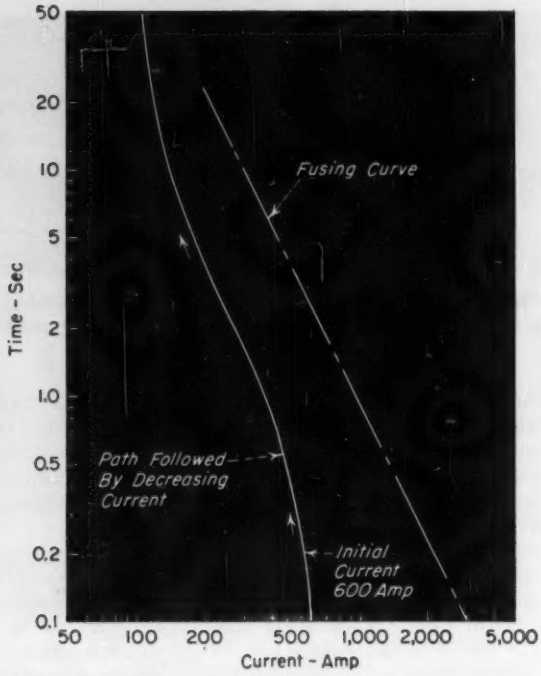


FIG 6—CURRENT decreases due to increased resistance of 109H steel phone wire which is heated by current flow

This would result from the rapid increase in resistance as fault current heats the wire.

Worst Case Considered

Initial fault resistance is determined by the resistance path from the point of contact to the nearest protector (Fig. 2). Maximum resistance would occur when contact is halfway between two protectors spaced at the maximum possible distance. The usual spacing is ½ mile, with an allowable variation of ¼ mile. For example, using a typical telephone line wire with 34 ohms per mile, the resistance for maximum spacing would be:

$0.5 \times 0.75 \times 34 = 12.75$ ohms.

When both adjacent protectors operate simultaneously, the parallel resistance path has an equivalent resistance of half that, or approximately 6.4 ohms.

Considering only the worst case, 12.75 ohms to ground would limit initial fault current on a 7,200-v system, 12.5 kv wye, to a maximum of 565 amp. This assumes that the power system impedance is negligible. But even when it is as high as 6 ohms, the current value is reduced by less than 10% as power system impedance is mostly reactive and adds in quadrature to the resistance of the telephone wire in the fault circuit.

Initial values of fault currents for zero-resistance faults at any point on a typical 12.5-kv feeder or lateral appear in Fig. 3. Fault current values for 20 ohms resistive faults are given in Fig. 4. Actual fault current values for contacts with telephone open-wire circuits at any point on the 12.5-kv feeder or one of its laterals and for any distance from a telephone protector can be estimated from these curves.

Normally only 20-ohm faults need be considered as the worst condition in coordination of fuses and reclosers is in the lower values of fault current. Exceptions are discussed hereafter in connection with wire fusing or "burndown." The 20-ohm value is the fault resistance for the smallest steel wire normally used in this type of open-wire telephone plant. It represents one size smaller than the typical telephone line wire previously mentioned.

How to ascertain whether both adjacent protectors will operate (thus affecting the amount of fault resistance and current) may be seen in the following example:

A power-telephone contact is 5 miles out on a main 12.5-kv feeder (Fig. 2) and a third of the distance between two telephone protectors spaced ½-mile apart. Telephone wire resistance is assumed to be 34 ohms per mile. Then,

$R_1 = \frac{1}{3} \times \frac{1}{2} \times 34 = 5.67$ ohms

$R_2 = \frac{2}{3} \times \frac{1}{2} \times 34 = 11.33$ ohms

In Fig 4 I_f is 1,070 amp but does not take into account the fault resistance. Assuming that X_p (power system impedance) is equal to the line-to-ground voltage divided by I_f and that X_p is reactive only, then:

$$X_p = \frac{7{,}200}{1{,}070} = 6.73 \text{ ohms}$$

$$Z_t = R_t + jX_p = 5.67 + j6.73 = 8.8 \angle 50 \text{ deg ohms}$$

Fault Current Calculated

When only one protector breaks down initially, the actual fault current is:

$$I_f = \frac{7{,}200}{8.8} = 818 \text{ amp.}$$

But with 818 amp flowing through the 5.67 ohms, the voltage at point of contact is $818 \times 5.67 = 4{,}638$ v; and as this is greater than the 3,000-v breakdown of the protector, the sec-

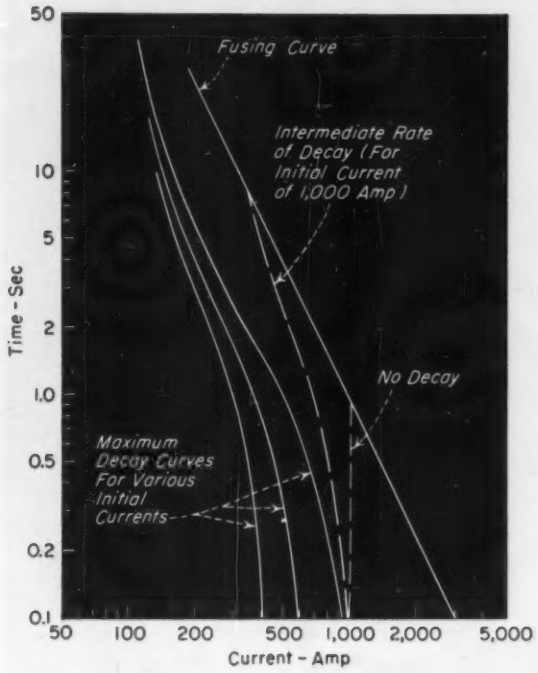


FIG 7—CURRENT DECAY RATES for initial currents on 109H steel wire become asymptotic to wire's sustained current

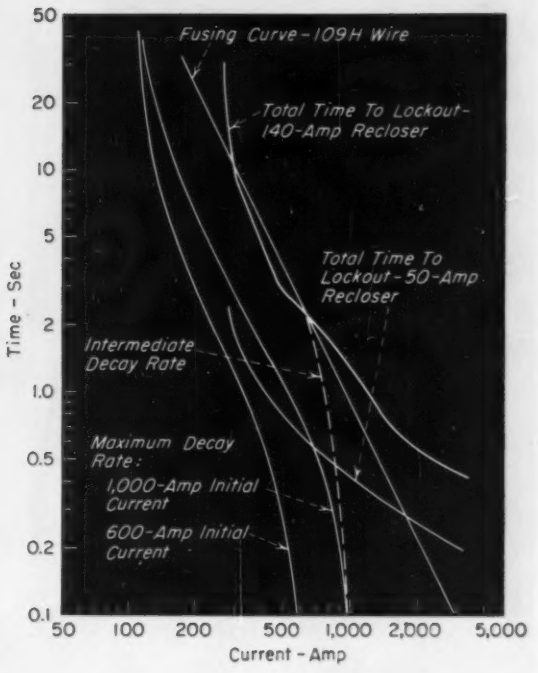


FIG 8—CURRENT DECAY must be considered in planning protective coordination for the telephone circuit contacts

ond protector at "B" operates.

Following this operation, however, the equivalent fault resistance is R_1 and R_2 in parallel, or 3.8 ohms. The total fault impedance then is:

$$R_f = jX_p = 3.8 + j6.73 = 7.73 \angle 60.5 \text{ deg ohms}$$

$$I_f = \frac{7,200}{7.73} = 933 \text{ amp}$$

and the voltage at point of contact is:

$$E_c = I_f \times Z_t = 933 \times 3.8 = 3.540 \text{ v.}$$

This value is high enough so that both protectors probably remain operative. But if the contact is farther out on the feeder or closer to one protector so that either I_f or Z_t is smaller, this voltage might be less than 3,000 v; and the second protector would not operate at all or would extinguish immediately after an initial flashover. This procedure establishes the initial value of fault current which may be expected under various conditions.

Must Outlast Wires

There is always the possibility of telephone line wire fusing before the power system protective device de-energizes the contact. This is an acceptable method of de-energizing provided it occurs at or immediately adjacent to point of contact so that none of the telephone plant remains energized.

The fusing curve for a typical telephone line wire, 109H steel, and the time-current characteristics for typical telephone back-up protectors are shown in Fig. 5. It is essential that the protector outlast the wire. When the protector does not outlast the wire, the telephone plant can remain energized without a path to ground for the power fault current. If a telephone line has a characteristic that results in failure of the protector before the wire fuses, the recloser size and duty cycle must be chosen so that even minimum current faults are cleared before the protector fails. Minimum current faults are those produced by a contact midway between telephone protectors.

Wire Heating Is Factor

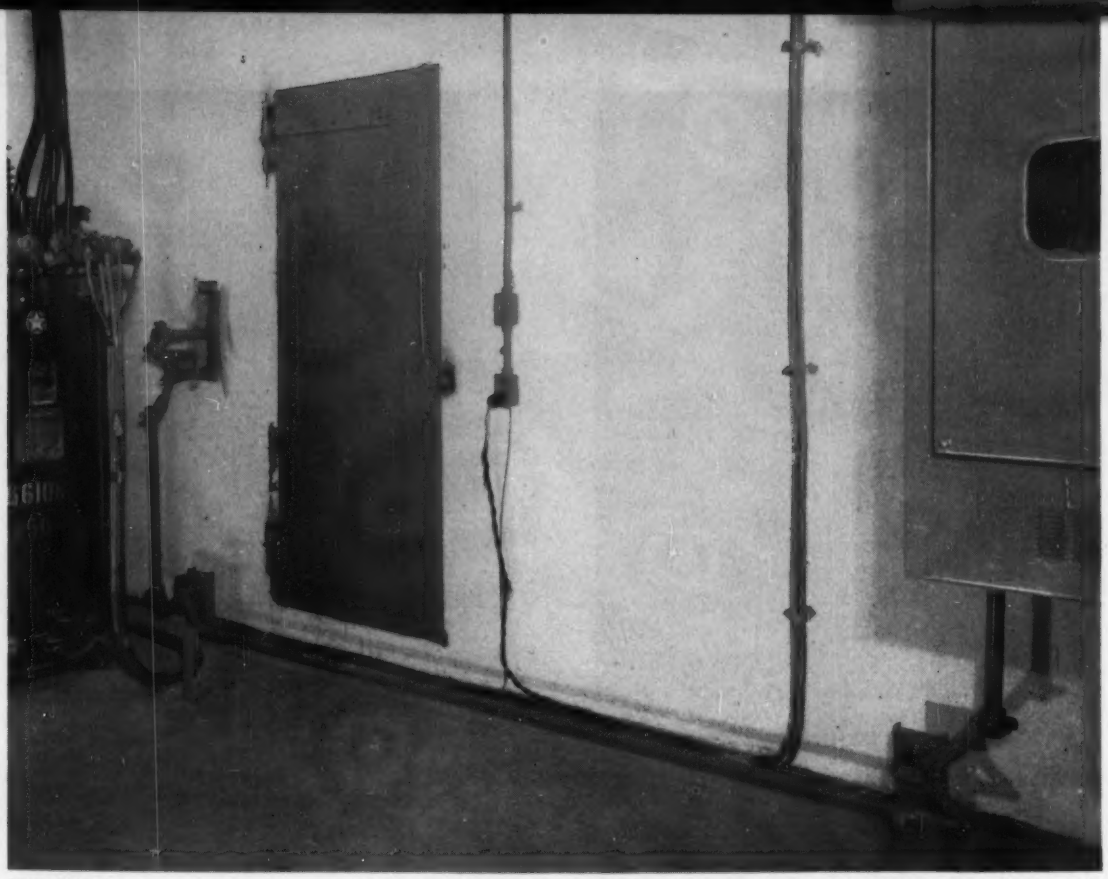
An important characteristic of steel telephone line wire is the increase in resistance caused by wire heating when carrying power system fault currents. A typical current decay curve for an initial current of 600 amp is shown in Fig. 6. Maximum current decay curves can be calculated for any size wire, and very reasonable approximations can be made when the sustained current-carrying capacity of the wire is known. A curve can then be drawn from the initial value of fault current as taken from Fig. 4 or 5 for the worst condition. This curve becomes asymptotic to the sustained current which the wire can safely carry without fusing.

Several approximate curves of this type are shown in Fig. 7. These are for 109H steel wire which can carry approximately 110 amp safely for an indefinite time. It can be assumed in drawing such curves that the decay rate levels off in 20 to 50 sec.

These decay curves, calculated or estimated, are for maximum rate of decay and assume that the fault current is controlled entirely by the telephone wire resistance. When power system impedance is dominant, as it is when the power-telephone contact is within, say, one span of a telephone protector, there is no current decay and the current follows a path similar to the "no decay" curve in Fig. 7. For other situations, current decay follows some intermediate path.

Decay due to wire heating need not be considered for currents much above 1,000 amp. Above that value there can

(*Continued on page* 206)



SHIPPER-ROD can operate the switch from outside the vault, thus protecting operating personnel when the switch handle cannot be brought directly through the wall. Personnel do not have to enter to kill faulty transformer

Interrupter Switch-Fuse Combination . . .

Cuts Small-Vault Switching Costs

DISTRIBUTION
Design

Provides bank protection. Proper fuse selection guards against operation of the switch above the rated current

ROBERT O. RANDLE, Supervisor, Underground Design Engineering, Houston Lighting & Power Co, Houston, Texas

The load interrupter switch and power fuse combination today affords safe and economical switching and protection for small transformer vault installations where economy is badly needed. Larger loads usually justify greater expenditures.

Suburban commercial customers requiring transformer banks in vaults have increased rapidly in recent years. Such banks usually are served radially through an underground dip from a distant 15-kv overhead distribution line. Because the outdoor 15-kv fuse cutout is too hazardous for the confined space of a vault, economical switching and protection of these banks are a problem.

Fuse Clears Faults

Where interrupting duty is less than 150,000 kva, a 600-amp, 150,000-kva, manually operated, oil circuit breaker serves economically. But interrupting duty on present-day systems often exceeds 150,000 kva; so the circuit breaker is very expensive compared with other equipment in a small vault.

In the operation of the load interrupter switch and fuse combination, the fuse clears the circuit of faults, leaving the switch to open load current only. This type of operation affords adequate short-circuit protection at a cost commensurate with that of the usual vault installation.

But there is danger that operating personnel, either unknowingly or through necessity, may open the switch on currents above its interrupting rating. There is also the hazard of flashover because of moisture and dust sometimes present in vaults.

In an emergency, such as a fire, this equipment is the last means of disconnecting the building and the only means of clearing the vault without dropping an entire feeder. Consequently, this important equipment must be safe and dependable.

Moisture and dust problems usually are solved by enclosing the equipment in a sheet steel enclosure with strip heaters to offset moisture condensation and filters on the air openings to remove dust. Insurance against the hazzards of operation at too high a current is a more complicated problem.

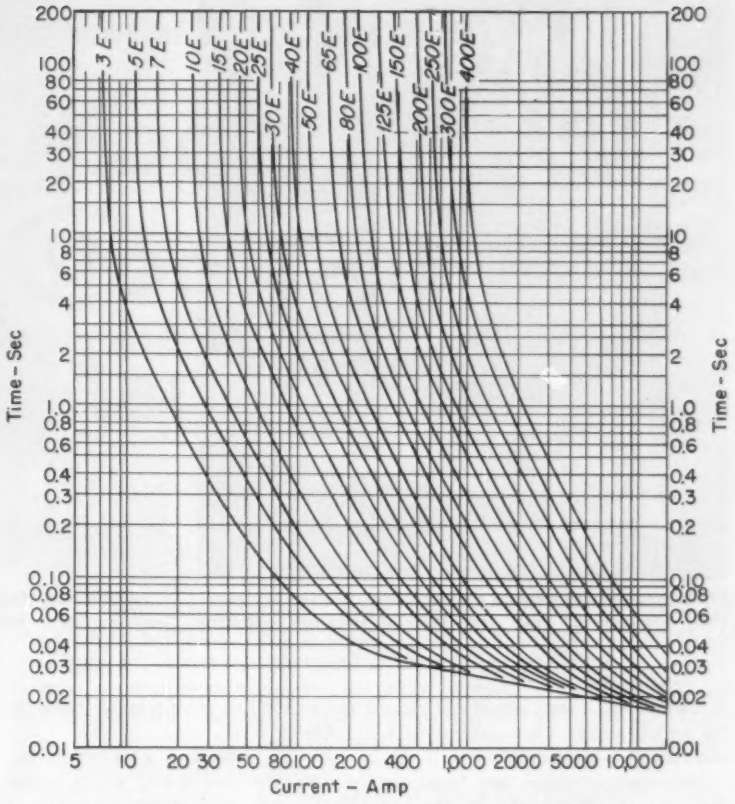
Analysis shows that solid primary faults are not the difficulty. They cause currents 20 to 30 times full-load rating which a standard fuse clears in about 50 cycles. This renders operation of the switch impossible before the fuse has cleared. The difficulty is with lower-current faults which a large fuse allows to remain on the line 15 min or longer, even though the current exceeds the switch interrupting rating two or three times.

Current Builds Up

Consider a 1,500-kva transformer bank operating at 13.8 kv and protected by a combination load interrupter switch with a 100-amp interrupting rating and a power fuse. Table I shows the full-load current is 62.8 amp and the recommended fuse size 125E. According to the chart, a current approximating 300 amp must flow to open the fuse. Thus while the current builds up from 100 to 300 amp, the switch is a hazard. As this is two to five times the current rating of the transformers, operating personnel may be under great pressure to open the switch.

This relatively low current is most likely to occur during a secondary fault or a turn-to-turn transformer failure. Current for such faults is either greatly limited or slow in building up, thus delaying or even preventing primary fuse operation. A secondary fault on a 1,500-kva transformer bank requires only 0.005 to 0.006-ohm impedance in the secondary circuit plus the fault to limit the primary current to 300 amp. Turn-to-turn faults usually develop until they flashover to ground, which may take considerable time. In the interim there is a gradual increase in current.

For such condition a fuse can be selected which affords both transformer short-circuit and switch operation protection. The latter is available through limiting the fuse size so that it will clear in a predetermined short time after the current has exceeded the switch interrupting rating. This leaves no opportunity for operating the switch at excessive currents.



TOTAL CLEARING TIME-CURRENT CHARACTERISTICS of NEMA E-rated fuses with interrupter switch must be coordinated with the switch and transformer size

Fuse Size Considered

In determining fuse size for switches of various interrupting ratings, a maximum allowable clearing time must be established. This involves coordination of fuse size, maximum permissible clearing time, and switch size with the transformer size. As clearing time, 2 sec is suggested; an operator

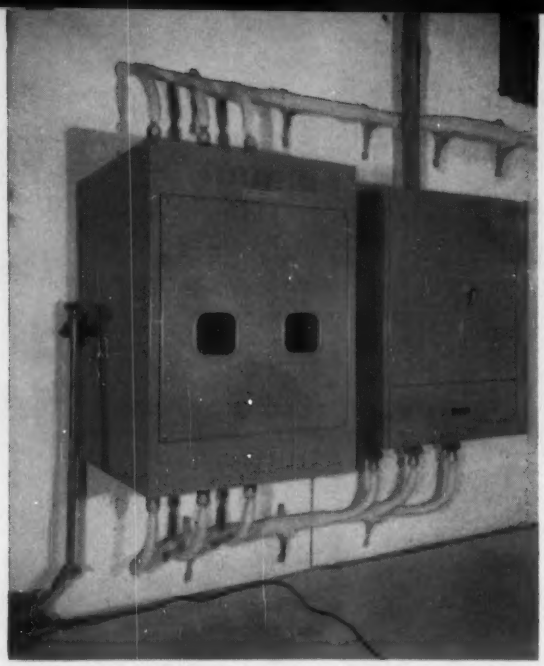
Table I—Recommended Fusing for Transformer Short Circuit Protection

Bank Size—Kva	Full-Load Current—Amp.	Fuse Size NEMA "E" Current Rating
100	4.2	10
300	12.6	25
500	20.9	50
750	31.4	65
1,000	41.8	100
1,500	62.8	125
2,000	83.6	200

Table II—Interrupter Unit Life Rating for Load Switching

50—100% Power Factor

Load Current Amp	No. of Operations
600	50
400	75
200	150
100	250
50	350



SWITCH AND FUSE may be mounted in a common enclosure. This arrangement costs less than a separate enclosure

SEPARATE ENCLOSURES for switch and fuse add slightly to cost but give more flexibility in arrangement in vault

in closing on a fault could not close the switch, detect a low-current fault, and reopen in less time.

Interrupting ratings are based on the load to be interrupted and the number of interruptions to which the switch is to be subjected. Normally switches on a single feeder are subjected to only a few interruptions a year.

Switches in a throwover arrangement are subject to more severe operating conditions.

After a maximum clearing time and switch interrupting ratings have been established, maximum fuse size and the transformer bank size with which a given switch can be used are determined from the chart and Table I. For a switch with 100-amp interrupting rating and 2-sec allowable clearing time, the chart indicates a 25E fuse as the maximum size. This corresponds to a 300-kva transformer bank in Table I.

By this procedure a switch having a 400-amp interrupting rating would be limited to a 100E fuse and a 1,000-kva bank.

Other ratings and sizes are given in Table III.

Arrangement Important

Care in the location and arrangement of equipment is essential. Where switches can be arranged for operation from outside the vault, a faulty transformer can be killed without anyone entering the danger area. Where the switch handle cannot be extended directly through the wall, shipper-rod operation is practicable.

On two-feeder throwover installations two switches can be interlocked mechanically to prevent paralleling of feeders. The interlock can be in the switches or at the operating handles outside the vault.

Switch and fuse may be mounted either in a common enclosure or in separate enclosures. Usually the common enclosure costs less. Separate units offer a flexibility of arrangement sometimes necessary in transformer vault design.

Moisture and dust conditions and the frequency of operation determine inspection requirements for each installation. For average conditions, one inspection a year should do. At the time of inspection the switch is operated and its performance checked.

Maintenance Outlined

Moving parts are examined visually for signs of breaks or of loosening or binding of the linkages. Fuse clips and threaded parts are checked for corrosion. Insulators and fuse porcelains are inspected for dust accumulations. Strip heaters are checked for deterioration or burnout. Air filters are inspected and, if necessary, changed.

Equipment maintenance presents a problem. As economy determined the type of installation, the disconnect and by-pass switches usually installed for maintenance of circuit breakers could hardly be justified. This means an entire feeder must be dropped for any maintenance work, a fact that should be given consideration in selecting the type of installation.

Table III—Maximum Fuse and Bank Sizes for Interrupter Switches

Switch Interrupting Rating—Amp	Max Standard Fuse Size—NEMA "E" Current Rating	Max Transformer Bank Size—Kva
50	10	100
100	25	300
200	50	500
400	100	1,000
600	125	1,500

A Special Report on

Modern Stores Management

● Storekeeping is a major utility expense. In fact it adds appreciably to the cost of everything a utility buys. Yet it receives little attention outside the stores managers' fraternity.

● The balance between never losing a minute of a lineman's time and not carrying a nickle's worth of excess inventory is difficult to achieve and maintain. Yet it can save thousands, even millions of dollars.

● A storekeeper must always be ready to meet his "customers'" demands. He must constantly search for new methods of handling, storing, and salvaging material. And he must maintain a close contact with the purchasing and using departments.

● Stores management is a big job. It is one, which if properly handled, demands a great deal of personal initiative. This is especially true as there is no set measure of performance. The nature of a utility's operation, its management's policies, and a host of other factors affect the operation of the stores department. In fact, as you will see in the contrasting articles on warehousing, an approach which is one utility's "cup of tea" might be directly opposite to the approach another utility must use to effect substantial savings.

● But there are six fundamentals which every stores manager must follow. He must provide (1) the right quantity, (2) of the right quality, (3) at the right place, (4) and at the right time (5) with minimum investment in inventory, and (6) at the lowest possible stores handling cost.

● On the next 15 pages these fundamentals and their application to specific areas of stores operation and management are described in detail. As you will see, stores management has many aspects and offers many possibilities for substantial savings.

ARY MOSSIMAN, Manager of Market Research
GEORGE SWIFT, Associate Editor

This Special Report Presents:

Fundamentals—Stores management balances needs and stocks ..... **page 114**
Stock Control—Paper work makes balance possible ..... **page 116**
Materials Handling—Mechanization swaps sweat for savings ..... **page 118**
Warehousing—Geography suggests the "better" system ..... **page 122**
Inspection—Vigilance gets you what you pay for ..... **page 124**
Packaging—Standardization profits utilities and suppliers ..... **page 126**
Salvaging—There's "real" money in it ..... **page 127**

Stores Management Exists Today

1. In Right Amount

2. At Right Time

3. Of Right Quality

W. M. HOLLS, General Storekeeper, Baltimore Gas & Electric Co, Baltimore, Md.

Modern stores management provides departments with materials, supplies, and tools in the required quantity and quality at the required time and place and at the minimum feasible investment and stores handling cost. In discharging these general duties, the stores department meets its responsbiility to other departments and company management.

Accordingly, the storekeeper must be ready at all times to meet the demands of his "customers." This involves his constant and careful attention to the search for new methods of handling, storing, and salvaging material. Furthermore, he must maintain close contact with the purchasing agent. Storeroom personnel under his supervision must readily identify the material handled and have some knowledge of its use. With such qualifications, storeroom employees can assist operating departments in avoiding delays and in making effective substitution of stock materials for non-standard items.

An efficient stores department maintains, insofar as practicable, an adequate supply of material for meeting a constant demand. The variety of needs of other departments necessitates a well-planned and efficient program of stock replenishment. The simple practice of requisitioning the purchasing agent to buy a quantity of material based on someone's unsupported estimate or of basing a purchase solely on past usage cannot be recognized today as effective stores control.

Today's storekeeper carefully analyzes unusually heavy withdrawals, sudden declines in usage, and unusually heavy returns from the field. He reviews the record of withdrawals and returns regularly and requires that the unusual demands of an operating department be established. When such withdrawals are unlikely to recur over an extended period, the storekeeper may ignore them in projecting monthly usage. On the other hand, they may augur a permanent demand.

A suddenly declining demand also requires careful investigation. Such reduction may be the result of the introduction of a substitute item of more modern design, a change in the company's policy or practices, or retirement of equipment of which the material is an integral part. Unusually heavy returns may be similarly meaningful.

Major Projects Require Planning

Past usage is not always a reliable basis for establishing quantities and, in fact, can be misleading. A department may base an unusual demand on a contemplated major project and neglect to give the stores department advance notice. Through constant contact with the using departments, stores can anticipate such projects and provide itself with the information for determining the approximate date when such materials will be used.

Planning for unusual demands involves provision of storage space. A major project may require large quantities and bulky items which cannot be accommodated in the available storage area. Consequently, stores must carefully schedule the time and size of deliveries over an extended period.

The stores department's responsibility extends beyond merely providing needed amounts. It must establish definitely that the materials ordered are suitable. When a purchase is involved, stores must consult specifications and furnish the purchasing agent with a complete and clear ordering description. Shipments delivered must be properly identified and carefully inspected. When specified, laboratory tests must be arranged. Sometimes factory inspection may be substituted for acceptance tests.

Materials recovered from the system and returned to the storeroom require careful inspection and sometimes

to Provide Materials and Tools . . .

4. At Right Place With

5. Minimum Inventory

6. At Minimum Stores Cost

tests. Inspection and tests not only determine a material's future usefulness but frequently suggest more effective salvage procedures.

In planning stock replenishments to have material on hand when needed, the stores department takes into consideration the lead time (needed to order, produce, and deliver the material), the ordering minimum, established from the lead time past usage, and the special requirements of using departments. It also considers follow-up for delivery.

Having materials available in the right place is a corollary of having them in the required quantity and quality at the right time. One means of accomplishing this is the establishment of substorerooms at the principal material distribution centers and in departmental shops. Prompt delivery of material to the job is a function of stores.

Trucking Centers Favored

Special trucking service by stores from a central distribution point eliminates delayed deliveries to the job. This practice is favored by many utilities. Night loading of trucks affords crews an opportunity to leave promptly at starting time.

Effective stores department practices at the lowest feasible cash outlay usually receive considerable attention from management. To achieve them, additional controls are required. These controls are based on planning the following:

1. Shipments made in advance of scheduled delivery dates.
2. New additions to stock.
3. Material returned from jobs.
4. Inactive and obsolete items.

Some suppliers make a practice of shipping in advance of the scheduled delivery date. This can be minimized by the purchasing agent when he assumes full responsibility for the correction of such practices. Requests of engineers and others for new items to be added to stock can be controlled by the storekeeper. It is his function to eliminate items which duplicate existing stocks except in unimportant features. His knowledge of materials in stock should help in establishing standardization.

The stores department must establish checks on returns from the system. The handling of these returns definitely affects the investments they represent. When a department finds material left over at the completion of a job or has recovered other material during the work, such material is normally returned to the storeroom. This is the usual procedure whether the material is regularly stocked or has never been considered a stock item. With regard to such material, stores must establish an adequate and effective follow-up on final disposition.

Inactive Stocks Must Be Eliminated

It is a stores function to clear inventories of material which has become inactive through changes because of improvements in installation methods, modernization of equipment, changes in company policy, or new rules governing safety. Periodic reviews of all stocks are consequently a necessary storeroom activity. The results of such reviews interest not only management but also the stockholders' auditors.

The principles of modern stores management call for careful control of materials handling costs. Such controls involve definite measures of performance in stores operations. Statistics must be maintained on the various essential functions, and stores personnel must have a thorough knowledge of the many practices in handling, storing, and salvaging material. Such personnel should be in constant touch with changes and improvements affecting equipment used in stores operations.

Stock Control Records Are Key to

Three times a week material issues are forwarded to stores accounting for "tab" which shows receipts, issues, balances, reorder points

E. J. MARTIN, General Superintendent, Stores, New Orleans Public Service Inc., New Orleans, La.

The repeating stock requisition, a punch card system for stores records, and a detailed M&S ledger record are the principal elements in the stock control method used by New Orleans Public Service, Inc.

In addition departmental arrangement plays an important role. The stores department's general office division adjoins the purchasing department. Both use as common files the repeating stock requisition file and the numerically bound duplicate purchase orders. Ledger records are centrally placed between the stores general office division and the stores accounting section of the general accounting department. The transfer posting machine is beside the ledger records.

Personnel of the stores general office division have immediate access to all records pertaining to stores operations. This obviates record duplication and expedites material ordering.

Where Requests Start

When a storekeeper must confirm an order, he phones the supervisor of materials. The latter checks the ledger, signs the repeating stock requisition, and hands it to a purchasing department member for ordering, all in two to five minutes. Confirmation is not encouraged but is done when necessary to avoid stock depletion.

Stock control starts before any item is accepted into stock. A request-for-stock form, fully executed and approved, is received by the stores department. This request is initiated by a standards committee comprised of representatives of operating and engineering departments. After review and comment by the appropriate storekeeper, the supervisor of materials satisfies himself through discussion with committeemen, when necessary, that the initial order and the maximum and minimum quantities are reasonable.

The request-for-stock form provides space for indicating whether the material requested replaces material in stock. When one material replaces another, the supervisor works with the committee regarding disposition of replaced material. Any material in stock which is to be replaced is used before issuance of the replacement material unless safety or economy dictates otherwise. When all pertinent factors have been found satisfactory, the supervisor approves the request-for-stock form.

Reorder Point Set

Many considerations are involved in determining what quantities constitute an economical purchase and the time for ordering so as to prevent both shortages and overstocking. The investment, possibility of obsolescence, availability of space, and the extra labor cost when material must be double-handled must be taken into account. After considering these, a reorder point is established for each item of stock, based on anticipated usage, delivery time, plus a time safety factor to provide for increased usage or slow delivery.

The reorder point is noted on the storeroom's record card and stamped in large numbers on the bin tag. Reorder points are forwarded to the department which tabulates issues on the accounting machines.

For every major construction job a bill of material is prepared and copies sent to the supervisor of materials and the appropriate storekeeper. Upon receipt of the bill of materials, stock balances are posted on it, and all material needed is ordered immediately and scheduled to meet the planned construction dates. To keep abreast of withdrawals for a particular job, the storekeeper writes a memo to the accounting department requesting a monthly "recap" of material charged to the job. The "recap" is done by means of the punch card system. The information enables the storekeeper to keep the bill of material for the job up to date during the work.

A job order, including material requirements, is prepared before all construction and certain maintenance jobs. Copies are sent to the supervisor of materials and the storekeeper. In reviewing the job order, they check unusual material requirements.

The storekeeper is responsible for the replenishment of stock. He is assisted by the stock clerk who checks the quantity in the bin with the reordering point on the bin tag when filling an issue.

Three times a week all material issues are forwarded to the stores accounting section where through the use of accounting machine cards, entries are prepared for the M&S detailed ledger sheets. A machine-made listing is returned to the storekeeper, showing in the following order:

1. Description of the material.
2. Date of the last transaction.
3. Unit price.
4. Date of present transaction.
5. Reference number (purchase order number or stores issue number).
6. Stock number.
7. Quantity and value of receipts.
8. Quantity and value of issues.
9. Balance of quantity on hand.
10. Reordering point as set by the storekeeper.

Thus, when a stock clerk fails to inform the storekeeper that a supply is low or has reached its reordering point, the storekeeper has an opportunity to remedy the oversight by a quick comparison of the quantity on hand and the reordering point on the accounting machine tabulations.

From this list and a summary showing all large quantities on bills of material, the storekeeper can quickly determine whether stocks exceed or fall below the reordering point. An increased trend in usage of some particular item or an unusually large quantity issuance is noted immediately.

By consultation with construction supervisors, the storekeeper is informed of unusual maintenance job requirements. When errors in the stock numbering of issues distort ledger balances, ordering of material is not deferred. The stock clerk has reviewed the quantity in the bin, and irregularities are quickly located.

Efficient Stores Management

The storekeeper, furnished with a material order record card, a balance on hand, and a reordering point figure, prepares the storeroom requisition in duplicate. He makes four entries for each item requisitioned:

1. Stock number, without description.
2. Quantity requested to be purchased.
3. Unit of purchase, i.e, ft, lb, etc.
4. Exact balance on hand in the storeroom, or an accurate estimate.

The original of this requisition, ordering as many as 13 stock items, is forwarded to the supervisor of materials. The latter enters the M&S ledger balance on this storeroom requisition for each stock item to be ordered. The repeating stock requisition is then removed from the file and this amount entered.

Consult on Balances

For each item ordered, the amount on hand, as shown by the ledger, is compared with that reported by the storekeeper. The supervisor discusses differences in these balances with him. Movement of the material is also checked by the supervisor to determine whether the requisition provides for the proper quantity. Frequently, after discussion with the storekeeper, the supervisor may increase quantities to get greater discounts or decrease them because of the slow movement of a material. When he is satisfied that the requisition is in order and not unusual in quantity or value, the supervisor gives final approval. When quantity or value is excessive, additional approval is required.

Deviations Need Approval

The storeroom requisition, with the repeating stock requisition, goes to the purchasing department for the purchase order. The quantity and quality of material indicated on the repeating stock requisition is bought. Deviations must be approved by the supervisor of materials and/or the standards committee.

Besides controlling quantities purchased, the supervisor of materials handles confirmation orders and the follow-up on deliveries when requested by the storekeeper. Most requisitions initiated by storekeepers reach the former on the same or the following day.

Six copies of the purchase order are prepared. The original goes to the vendor. One copy is filed numerically in binders as a permanent record in the stores general office division, invoice section. Four are used for a material received report. These are forwarded to the storeroom which will receive the material.

Upon receipt of the material-received report, the storekeeper checks each item ordered against the duplicate copy of the requisition and posts the necessary information on the material order record card. When he notices that an item on this requisition remains unchecked after sufficient time has elapsed and inferentially has not been ordered, he phones the supervisor of materials to investigate.

The stores department receives, checks, and completes the material-received report for all non-stock items purchased with few exceptions. Besides handling requisitions for stock materials, the supervisor of materials approves direct material requisitions. Thus he prevents purchase of material already stocked. As direct requisitions require his approval, he has an opportunity to suggest use of a similar item in stock or arrange to stock material ordered repeatedly. Thus, by eliminating clerical work in the ordering and receiving of and payment for material purchased directly, he saves money.

Reviews Similar Items

When necessary for a storekeeper to order an item, he reviews all similar materials. Any near the reordering point are ordered at this time. In making such an order, he may increase or reduce items to balance stock. Many items in regular use are ordered on a scheduled basis. When the next-to-the-last or last shipment is received, another order is placed.

A monthly report is prepared of wire on hand and on order. Amounts are in units based on the last 12 months' usage. This report, expressed in months, shows supply on hand and on order and the total. With this as a guide, wire is ordered and scheduled to balance the stock. The number of months' supply on hand and on order is always kept safely in excess of currently quoted delivery promises and can always be increased or diminished to assure proper inventory supply without overstocking.

At each month's end, the accounting, operating, and stores departments contribute to a transformer report which gives:

1. Sizes and types of quantities on hand, both new and used.
2. Number to be repaired.
3. Quantity on order.
4. Present number on the system.
5. Quantity used on the system in the last 12 months, with increase or decrease.
6. Number of months' supply on hand and on order.

Use of this report minimizes over-ordering and underordering. The accounting department annually furnishes the stores department with individual slips for all slow-moving items. Each slip notes the last date of movement, quantity used in past year or two, present value, and other pertinent matters. The storekeeper then investigates each item and its user. Items of no further use to the company through obsolescence or for other reasons are thus determined. Vendors are asked to accept returns.

When this cannot be done, the material is sold as scrap.

Reports to Managers

At the close of each month the accounting department prepares a stores report for the various managers. This report, listing major classes of materials and each storeroom, has the following information:

1. Balance on hand at the end of current month with increase or decrease over last year.
2. Receipts and issues for the current month and for 12 months ending with the current month.
3. Turnover ratio this year and last.

Another section of the report gives the accounting distribution of the material issues for the current month and the 12-month period, the purchasing, stores, and stores accounting expenses for the current month and the 12-month period, and the expense distribution for the same period.

Improving and Mechanizing Materials Handling a Challenge

- Here are four pages showing highlights of CEI's materials handling

TWO SUCH CRANES have reduced the manhours required for unloading a carload of poles by 75%. One hooks a loop sling around three to six pole butts, lifts and slides poles forward. The two cranes, in unison, place the poles on skids

L. C. ALEXANDER, Superintendent Transportation and Supplies, Cleveland Electric Illuminating Co, Cleveland, Ohio

Continuing and varying demands for diversified materials present an ever-challenging materials handling problem to the transportation and supplies department of Cleveland Electric Illuminating Co. Employee interest and participation in solving these problems have greatly eased the situation today and have laid the groundwork for more ready solutions in the future.

Employees have participated through the following programs:

1. Work simplification. All employees have been requested to submit their solutions to ever-changing handling problems. This program has been outstandingly successful, proving that people who handle materials are aware of the increasing challenges presented and are eager to help meet them. New ideas have ranged from changes in floor sweeping methods to complex warehouse layouts.

2. Standardization. Through this program employees have eliminated many duplicate or similar items from stock. Here again people who handle materials were requested to assist in preventing duplication, overlapping, or variations. Results were excellent.

3. Mechanization. This program encourages employees to express their ideas. It has aided greatly in reducing the back-breaking handling of materials and supplies.

Participation by employees in all these programs has resulted in reduced resistance to change and safer and better methods of handling materials. Palletization and unit loads have reduced material handling cost today and have resulted in a saving of space, particularly in the warehouse and storage areas.

Looking ahead and basing predictions on today's methods of advancement, the future warehouse will include conveyor systems for delivering, within the warehouse, materials from the vendor's truck to warehouse locations and from warehouse locations to loading platforms of company trucks with elimination of physical handling.

Much effort will be directed to layout and new equipment for complete space utilization and handling of a tremendous volume increase within the warehouse facilities now available.

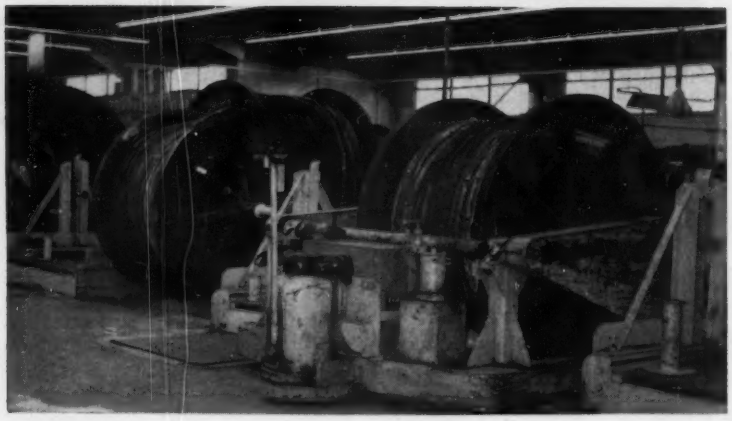
This presents the greatest cost reduction possibility in CEI's stores operation.

FIBER CONDUIT handling in unloading has been reduced 88% through improved packaging and handling. Bundles of approximately 250 pieces are received in an open truck. Loose strapping permits unloading directly into storage racks. Rack and conduit are later loaded onto company trucks for delivery as a unit to job

FORK TRUCKS transport wire directly from delivery trucks and store the coils on special racks within the storeroom

COIL RACKS for the various sizes of wire have simplified the handling of wire from delivery to issuance

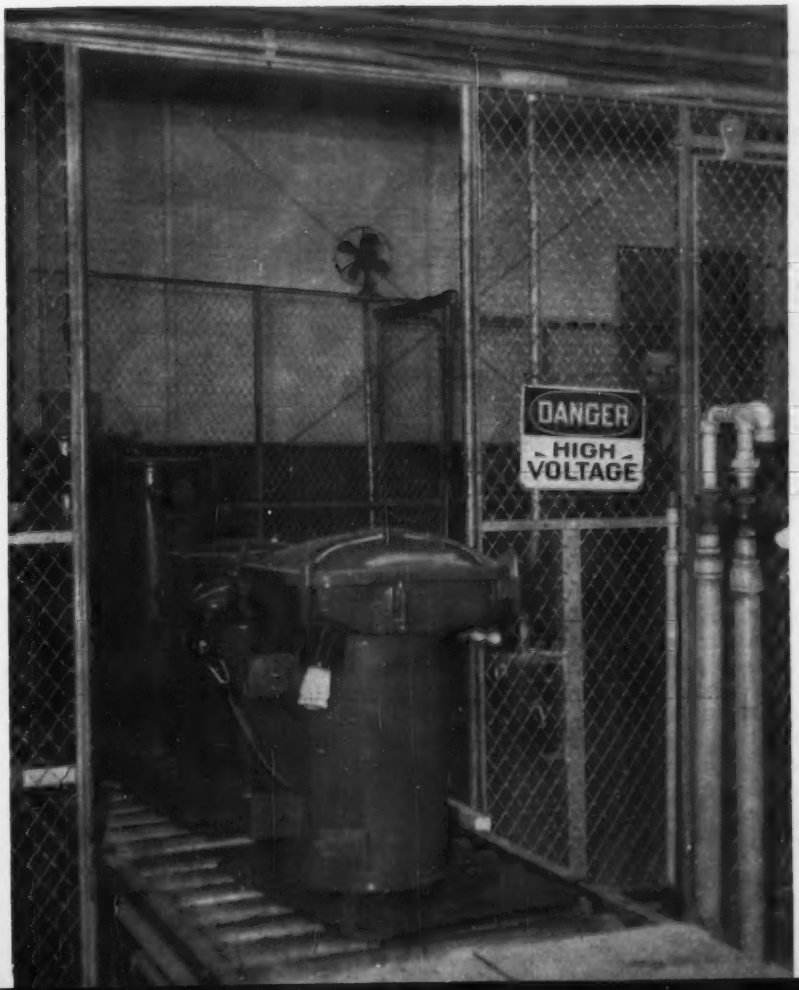
JACK STACKER has added 20,000 feet to storage area. It is lifted to balcony on forks of a large fork lift truck. When not needed on the balcony it is returned to the main floor

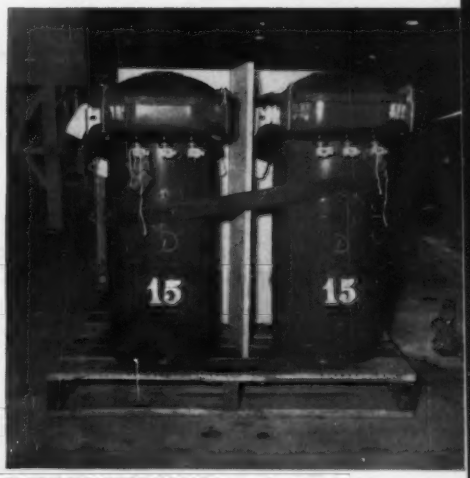


CABLE REELS are efficiently handled by battery-powered handler units

MATERIALS are received, stored, and transferred on pallets when possible

CONVEYOR SYSTEM simplifies servicing transformers in the transformer shop





TRANSFORMER PALLETS have decreased damage in shipment between sites

TRANSFORMERS are serviced, repaired, and tested while on conveyor system

Central Warehouse Is Economic

• "St. Louis Plan" cuts driving time, number of short items, inventories, building, operating, maintenance costs and speeds service restoration

R. S. KING, General Storekeeper, Union Electric Co, St. Louis, Mo.

A central warehouse, supplying district or distributing stores, constitutes a centralized stores system. A decentralized system supplies district stores from the stocks of jobbers and manufacturers. There is probably no stores operation that can be flatly classified as either; yet segments of overall stores operations can be profitably centralized or decentralized.

For example, there is centralization of supply of materials, transformers, and meters for overhead line trucks operating in the St. Louis metropolitan area. This area includes St. Louis, East St. Louis, and suburban territory within about 25 miles of the central warehouse.

Before centralization, Union Electric Co had five warehouses in this area, fully stocked and manned for two-shift operations five days a week. These have been replaced by six overhead work centers. Another work center is under construction, and two more are planned for next year. Thus there will be nine work centers much nearer the center of each of the nine districts' work load. Each will accommodate eight line trucks. As more trucks are required in the area, additional work centers will be set up.

At these locations there are no storerooms or stores personnel. There are only a few transformers and a very small amount of material for emergency use.

Foremen's orders are received at the central warehouse the afternoon of the day before material is needed. Materials are assembled and loaded on 32-ft, low-side semi-trailers and delivered during the night to the work centers.

Stores drivers unload the material and place it in a service aisle at the rear of each line truck. Material, transformers, and meters removed from service and excess new materials are removed from the line trucks by the stores drivers and loaded on the trailers for return to the warehouse or salvage shop. Overhead truck drivers load their own material, transformers, and meters.

Union Electric supplies three contractors' work centers in the same way, except that the contractors unload and load the trailers. The company is now supplying 100 trucks from the central warehouse.

Union Electric is also setting up small work centers in its urban area to service two or three trucks. These

Decentralization Fits Big Areas

• In Consumer Power Co's 28,500 sq miles, utility's many stores centers serve best to control costs and keep operating departments supplied

W. N. McCLELLAND, Storeroom Material Supervisor, Consumer Power Co, Jackson, Mich.

Centralized warehousing, so satisfactory in large metropolitan areas where a company's operations are confined to a relatively few square miles, is impracticable for Consumer Power Co, serving a total area of 28,500 sq miles.

Consumers Power, providing gas and electricity in the Lower Peninsula of Michigan, reaches from the Ohio border to the Straits of Mackinac, roughly 400 miles, and from Lake Michigan to Lake Huron, excepting the Detroit and Thumb areas. The company has 12 divisions with headquarters at Alma, Battle Creek, Bay City, Flint, Grand Rapids, Jackson, Kalamazoo, Lansing, Muskegon, Pontiac, Saginaw, and Traverse City.

Each has a full complement of operating personnel and a main storeroom for supplying materials to area projects. There are also 36 substores at strategic points servicing out-of-the-way areas. Direct shipments are made only to the 12 division stores which supply the substores. A general stores has been set up at Jackson to take advantage of savings on carload shipments of control cables, meter accessories, and pole line hardware.

The size and continuity of the investment in materials and supplies compel careful consideration of control. The material control section of the purchasing and stores department exercises control while keeping stores properly stocked. The section is composed of a supervisor, analyst, two material tracers, and two clerks.

These work primarily from current reports from a centralized stores accounting unit which functions as a clearing house for incoming source data and outgoing reports between storerooms and the general accounting office. The reports are:

1. Stock status report, received 48 times yearly, which gives current month and quarter usage activity, balances, number of months' supply on hand for each division and general stores.

2. Storeroom transaction report which gives activity by storeroom, present balances, etc.

3. Division storeroom ledger which gives balances in storeroom by items, current month's activity, etc.

The decentralized stores organization, together with centralized material control, has cut the total inventory

will be supplied from the central warehouse once weekly.

Union Electric has set up its stores system on both the centralized and decentralized plan. On the basis of its ten years' experience with the present centralized system, called the "St. Louis Plan," the company has concluded that such a system has these definite advantages:

1. It saves line department driving time to and from jobs. Small work centers, as needed, may be set up near the center of the work load at only minor increases in stores costs.

2. Having all materials in one place reduces the number of short items and provides better service. The number of short items increases as the number of stores locations increase.

3. Inventories can be reduced as much as 50%, the percentage depending on the number of distributing warehouses eliminated.

4. The investment in stores buildings and equipment is less, and consequently stores operating and maintenance costs are less.

5. As compared with supplying from the central warehouse to an intermediate warehouse to the trucks, direct supply from the central warehouse to the trucks reduces the handling effort about 40%.

The "St. Louis Plan" is used successfully by other utilities. R. L. Leach, general storekeeper of Georgia Power Co, says of it:

"We began using this plan about 1948 by so serving a single suburban location, and we have expanded to the extent that we are serving five locations. The plan is now considered complete, except for one possible additional center. The plan adequately serves every need.

"About six line crews are assigned to each suburban location. This means that we daily serve about 30 crews under the plan. No difficulties have been encountered, and we are using the same methods today that we used at the beginning.

"I am certain that, given the opportunity to go back to the old system or to convert to an individual district operation, all of us would elect to remain just as we are."

Tom Nickelson, Detroit Edison Co, says:

"Because of centralization we have been able to reduce our overhead stock by $1,400,000. This is on the basis of the amount of stock that we were carrying in 1952 which was 3.3 months' supply. In 1955, with increased passout, we were carrying 2.2 months' supply. Our passout per manhour worked has increased from $37.50 to $49.90. We used 1% per month or 12% a year as the carrying charges for stock. Increased stock passout was 24%. Centralization has also helped us to reduce clerical, procurement, and tracing time.

"Warehouse space released for other purposes deferred the construction of $885,000 worth of new buildings. The saving on this amount in interest, taxes, and insurance was $70,000.

"Material centralization has resulted in better services to the overhead lines department. The general superintendent of the overhead lines department, after a tornado which occurred in early 1953, stated that restoration of service was much quicker under the centralized plan."

some $2½-million in the past three years.

In the selection of the method of warehousing, some items exert more influence than others. One is poles. Without the decentralized warehouses, the cost of moving smaller poles to the various usage points would add a quarter to a third to the price. Larger sizes would add less, probably 15 to 20%.

This extra cost would be for the labor of rehandling poles, along with equipment for handling large sizes and large quantities. When shipments are direct, Consumers Power gets along with equipment for handling the smaller poles. Nor is there need for special trucks.

Moving poles can be a traffic problem, often costly in view of the labor and equipment. Detours of many miles are not uncommon in transporting them from town to town. Consumers Power has no traffic problems when the vendor ships the poles to various locations. The company uses about 40,000 poles a year, some 13,000 of them 50 ft or longer.

Pipe and accessories are almost as important as poles. Consumers Power ships pipe directly from its own or from a commercial wraping plant to the using division. This costs less in handling, handling equipment, and freight charges but incurs the cost of carrying a somewhat larger inventory.

After much comparative analysis of methods for handling service cables and the general run of pole-line hardware, Consumers Power has found that it saves thousands of dollars through its decentralized stores system. The company uses nearly 6 million ft of Triplex service cable annually. It saves about $11,000 yearly on shipping charges alone throughout the system by using Flint as a medium shipping point.

Local vendors ship machine and carriage bolts, washers, one-wire racks, and common items of pole-line hardware directly to division stores. Orders are placed for a six-months' supply, and deliveries are received once a month. Such ordering allows the vendor any economies inherent in long lead-time ordering. Based on yearly shipments of roughly 1,500,000 lb, the savings in freight are approximately $10,000, and fewer men are needed in general stores.

A centralized system could not deliver materials to restore service promptly when ice, snow, sleet, or heavy winds hit. The decentralized system assures enough material for restoring service at least partially.

The company also has a decentralized construction stores system, with storerooms at Saginaw, Jackson, Grand Rapids, and Traverse City. When a transmission line is being built, the construction stores supervisor leases land close to the job. There poles, cable, insulators, and other major components are shipped. Small items go to the construction storeroom in the area until asked for by the construction foreman.

The advantages decentralized operation with centralized control are:

1. Less labor because rehandling has been minimized.

2. Less freight and transportation charges because of direct shipments.

3. Less costly handling equipment and maintenance on such equipment.

4. Materials are on hand for an emergency.

How a Utility Makes Certain

- Quality inspection varies from checking deliveries to acceptance tests on sample in accordance with standards
- Engineering and operating departments in some companies develop specifications and tests for materials

H. T. SIMPSON, Superintendent, Stores Department, Boston Edison Co, Boston, Mass.

Quality is a primary factor in the purchase of materials and supplies by utilities. To a degree depending upon the extent of the operations involved, engineering, operating, purchasing, and stores departments take part in determining this property. Inspection for quality varies from checking supplies by receivers and operating personnel to setting up standards and subjecting materials received to an inspection procedure before acceptance.

A utility handles a great variety of materials purchased and warehoused for operating and construction use. Thoroughness and the methods of inspection vary with the materials considered. Analysis of boiler feed water chemicals differs from inspection of highly technical items, such as generating station spare parts, substation equipment, and meters.

Although basically similar, company inspection methods differ in degree of thoroughness in the examination of pole type and subway type materials such as cross arms, poles, transformers, line hardware, luminaires, wire, and cable. Miscellaneous supplies, such as stationery, paints, tools, and other items of a general nature, may be spot checked or thoroughly examined and tested, depending upon the requirements or quantities involved.

Engineering and operating departments develop the ordering specifications for materials other than miscellaneous supplies. It is common practice for these groups to conduct factory inspections during the manufacture of certain highly technical items. Examination of materials upon receipt is usually performed by these departments or by stores personnel in companies with separate inspection organizations. Arrangements for electrical and mechanical tests are the responsibility of the department making final inspection for acceptance.

BORING SAMPLES are taken by utility company inspector to check the penetration of treatment in wood of carrying poles before their acceptance in stock

Procedures Vary

Inspection of boiler feed water chemicals may vary from comparison of markings on the goods with order descriptions to a more complete examination, including certified test reports from suppliers or an analysis of samples from each lot received.

Generating station spare parts and substation equipment are usually highly specialized materials. Determination of correctness and quality extends from a comparison of nameplate data and catalog numbers with the purchase specifications to an investigation in which drawings are checked and arrangements made for electrical and mechanical acceptance tests. Watthour and demand meters are accepted when nameplate readings agree with order details although in some companies final acceptance depends upon complete tests by the operating department, or by a laboratory.

Stores Personnel Inspect

Usually inspection of pole type, subway type, and street lighting materials is performed by stores personnel. Standardized items—distribution transformers and street lighting equipment—ordinarily are accepted after comparison of nameplate data or catalog number with order descriptions. Some companies, however, employ more thorough inspection procedures, including a requirement that manufacturers furnish certified test reports, examination of entire or sample lots, and acceptance tests.

Sample inspection prevents accept-

It Gets What It Pays For

ance of undersized line hardware and improperly galvanized or zinc-coated items.

Wood products usually are inspected thoroughly before acceptance by most companies. Ordinarily examination of carrying poles is made both before and after treatment, and cross arms are examined before manufacture. Inspection insures that the quality of these items, as determined from slope of grain, size and location of knots, pitch pockets, penetration of preservative, etc, is not lower than specified.

It is common practice to accept line wire after a sample physical check and verification of quantity by weight. Acceptance of other wire and cable varies from comparing manufacturers' markings and sample checks with order details to acceptance after thorough examination. Sample inspection quickly discloses skimping on cross-sectional areas of wire insulation and sheath. In many instances, certified factory test data or independent agency test reports are required for sample lots or entire shipments to insure quality.

CONCRETE LAMP POSTS ordinarily are checked by a utility company inspector who compares details of the lamp posts delivered with specifications on blueprint

Departments Specify

Specifications for miscellaneous items, such as stationery, paints, tools, and general supplies, are usually developed by operating, service, and stores departments. Stationery is most often purchased after approval of samples, but in larger companies more complete checks are made to see that quality of the paper specified is received and that all printed matter is correct.

Quality of paint is not determined by catalog numbers and brand names only. The using departments make field tests of sample batches from time to time to see that standards are maintained.

Customarily, tools and general supplies are accepted on the basis of brand name or catalog numbers. In larger companies, the "know-how" of a separate inspection group plays an important part in acceptance of these items. Besides a thorough examination to see that required physical characteristics are present, the inspection group arranges for tests to determine whether other features—composition of ingredients, tensile strength, discharge rate, etc—are as specified. Tape, solder, sweeping compounds, flashlight batteries, insulations, etc, are items in this category.

Serviceability of any product depends upon three factors: quality, quantity, and workmanship in the fabricating processes. Experience indicates that most manufacturers are acutely conscious of these factors. Their continuous efforts to improve quality have produced better products, frequently at lower costs. Inspection not only assists in maintaining required standards but very often helps, through constructive criticism, to raise standards for the mutual benefit of producer and consumer.

Insures Quality

Inspection also prevents acceptance of substandard items from the occasional manufacturer who has not been made aware of company requirements or from a dealer seeking a quick profit at the expense of quality.

Inspection cannot put quality into a product. It can and does insure that the quality specified is obtained. Such "insurance" is cheap when complex items are involved and large quantities are purchased on a competitive bid basis.

Cost Held in Line

Aware of their responsibility to give the best possible service at the lowest possible rate, utilities hold inspection costs to a minimum consistent with the quality required by the establishment of routine checks or elimination of inspection on standardized items received from manufacturers using known quality control systems and also by accepting manufacturers' certified test reports. Inspection not only improves vendor-purchaser relations by helping suppliers to understand utility needs but guarantees that utilities are getting what they pay for.

Vendors, Utilities Share Savings

• Standardized containers effect economies in transportation costs, warehouse space needs, and also facilitate receiving and issuance

H. E. HODGSON, General Storekeeper, Wisconsin Power & Light Co, Madison, Wis.

Standard packaging of products to be transported and distributed to customers has been one key to industrial development. Industry everywhere has sought to have commodities packed and labeled according to some agreed-upon standard since the adoption and general acceptance of the original tables of weights and measures.

The movement to standardize packaging got its greatest impetus in our own United States. The urge to have equivalent products uniformly packed has increased constantly with the development of long-distance transportation. This has been true from the days of the pack horse, to the present when it is possible to envision the movement of commodities by jet-propelled air freighters.

Effective utilization of limited high cost cargo and storage space under our system of high production, rapid movement, fast turnover, strict accounting, and intricate finance has placed a high premium on uniform packaging.

EEI Assumes Leadership

Need for it has been especially acute in the public utility field. There is repeated use for a large number of equivalent items under strict accounting in electric, gas, and water production and transmission and distribution work. A great variety of commodities, all common to operating companies, are used nationwide and are available from several sources.

High cost stores operation results from ordering, receiving, storing, and disbursing equivalent items obtained from many different suppliers in a great variety of containers of no uniformity in shape, count, and weight of contents. Ordering requires the processing of quantities into multiples common to one supplier only. Receiving involves a meticulously detailed counting job. Dock and warehouse work becomes slow and cumbersome. Space requirements are multiplied. Bad housekeeping and confusion are encouraged. Unsafe practices begin to crop up. Disbursing materials to the field becomes slow piece-by-piece order picking. Problems of inventory control are aggravated, and the ability to mass-handle and store material with machines is badly restricted.

It became obvious in the last decade that the utility industry was faced with unprecedented growth. Stores and purchasing administrators sensed that the ingenuity of their people would be taxed to the utmost to acquire economically, handle, account for, and control the volume and value of goods to meet this growth.

Stores and purchasing people with foresight, realizing that lack of uniform packaging was a deterring force, entered upon an organized program to improve the situation. Under leadership of the Edison Electric Institute, through its Purchasing and Stores Committee, the work was assigned to a special task group now known as the standard packaging nomenclature subcommittee.

Electric transmission and distribution line hardware is comprised of some 4,000 individual, separately accountable items in utility companies' inventory. Through 1947 these products were received in over 160 different sized and shaped containers, ranging from simple bundles and bags to kegs. Contents varied widely among suppliers and even to some extent between shipping points within a given supplier's organization.

It was found that of 124 boxes in regular use, only two were common between two companies and only one other was common to a third. Over one third of all line hardware items was shipped in packages exceeding 100 lb. Each supplier had his own method of determining the most suitable container. Similarly, using companies concentrated on their own problems of packaging, many times disregarding the suppliers' wishes. Confusion was common, and on occasions irritation and discord developed.

Committee members quickly learned that all the uneconomical features of existing practices had similar effects on supplier organizations. The problem then was jointly shared, and its solution would be jointly beneficial.

The work already done by some producers of line hardware in the development of acceptable containers and adjustment of the quantity of contents was taken as a pattern for study. Suppliers at an invitational meeting of all parties at Pittsburgh in late summer 1947 were told of conditions. This took place after a prodigious task of preparing comparative data assembled by utility people from information furnished by manufacturers on special forms.

The seriousness of the situation was immediately recognized. Almost total agreement and complete harmony and understanding developed. Progress came rapidly through hard work at subsequent meetings after research in a laboratory confirmed the belief that all items of line hardware could be satisfactorily packed, transported, and stored in a minimum number of packages of acceptable design with uniform content of equivalent items.

Hardware Problems Eased

It is possible now to acquire practically all items of line hardware produced in the country in no more than 15 different dimensioned boxes of the same type, uniformly labeled, with a uniform count of contents, and limited in weight. Provision was made for bulk users to make individual arrangements with suppliers to acquire shipments in any quantity or style of pack agreed upon without disrupting the normal plan.

Organization was developed for perpetuation of the work, and to date the original uniformity, harmony, and understanding have been maintained. Manufacturers are continuing the work through a special section of the Line Hardware Institute.

Through these efforts, utility stores and purchasing work has been made easier and more accurate. Inventory control has improved, and there has been a more effective use of money invested in inventory. Production has been

greater and service improved. Great economies have been realized through better utilization of existing storage space, eliminating the need for additional space. Employee relations have improved as warehouse work became more orderly, with faster, easier material handling and less exposure to strain and injury. Mass material handling on skids and pallets has reduced manpower requirements. Manufacturers report that similar economies have taken place in their organizations.

Stores and purchasing people, acting through the American Gas Association, stimulated all producers of pipe fittings, valves, and associated items to take tremendous strides toward uniform packaging of those products, contributing much to the overall movement.

Subcommittee Reactivated in 1953

Upon completion of the work on line hardware, very little organized work was done by the subcommittee with other types of utility supplier. Individual producers of other related products, however, continued the development of containers of suitable design, uniform count, and weight of contents acceptable to customers. As far as is known, no formal action was or is being taken to insure that like or equivalent items produced by two or more manufacturers are packed uniformly.

The subcommittee was reactivated in 1953 to study uniform packaging of distribution and transmission line types of porcelain insulators. The work progressed slowly. The subcommittee spent considerable time gathering information on current practices and in becoming familiar with packing and shipping problems in this field.

Following a roundtable invitational meeting in Cleveland, producers were asked to supply up-to-date information on their packaging practices. Comparative data were prepared, and members of the subcommittee circularized this information among EEI member companies. Sufficient sampling of user preference seems to have been made, and subcommittee members are studying the answers. They are nearly in agreement on what appears to be a uniform packaging arrangement acceptable to the user.

Works on Insulator Packaging

Plans are pointed toward a relatively quick settlement of the insulator packaging plan. The aim is to have all EEI-NEMA standard insulators, from all sources, supplied in packages having a uniform count of contents. Uniform arrangement within the package is desirable so that packages containing equivalents from all sources compare in size and shape. Uniformity in marking the packages with identity of contents will be a part of the plan. The bulk user will have provision for arranging individually to accept shipments in any quantity and in any type pack desired. Every effort will be made to keep requests within reason so that any change a manufacturer might be required to make will not work a hardship.

Thus utility stores and purchasing work will be further simplified, less costly, and more precise. Improved inventory control will be established over an additional group of repeately used equivalent items. Higher quality service will be rendered to using departments. More storage space will be conserved, and more tonnage handled with less manpower.

Scrap and Salvage in Modern Stores Management

Salvage Today Is Big Business

• In survey 54 companies reported scrap sales totaling about $21 million in 1955, representing an average of $389,000 per utility

R. L. LEACH, General Storekeeper, Georgia Power Co, Atlanta, Ga.

Many men have a tendency to make a hobby of some aspect of their daily work, perhaps originating, as happened to the present writer, in some chance remark heard years ago. In 1925, he heard an address in which the speaker said, "Both men and machines wear out and must be replaced, but the continued progress of the world is best assured by salvaging from each whatever is still useful." These words have since been an almost daily reminder that nothing should be discarded until intelligent analysis shows that it has no marketable value.

Scrap and salvage work is fascinating as well as profitable for anyone who studies it as it deserves.

The importance of scrap and salvage work was brought out by the results of a recent survey of 66 selected utility companies. Of these, 54 gave the information requested. These utilities, reporting from every part of the country, serve from 52,000 to 2,800,000 customers and operate in areas varying from 49 to 89,000 sq miles. Collectively they face every type of operating condition that can normally be expected to develop; so their average experience is fairly representative of the industry.

This group reported 1955 scrap sales totaling approximately $21 million, representing an average of about $389,000 per utility. This important money bespeaks careful thought and attention to scrap and salvage activities.

Scrap and salvage activities must be properly placed within a utility. The work is such that it might, with some measure of success, be made part of any one of several department's operations. Any organization may have a person with an aptitude for directing such work. The work, however, is closest to that of purchasing and stores personnel who are also in the best position for evaluating market conditions and commodity value developments. They also have the training and experience for handling the job.

The chief aim of every scrap and salvage organization is to handle its work and market its products to obtain the maximum return. No one knows all that can be done to improve the return, and the present writer offers no infallible system. Yet there are fundamentals that may be followed to advantage, including these:

1. Scrap is often generated at a distance from the best markets. Transfer to the best markets is feasible so long as there is a profit over and above the full cost of the operation. The ability of a utility to transfer scrap stimulates local markets.

2. Competitive bidding is one means of marketing scrap to the best advantage. It gives each dealer the same opportunity which may react to the benefit of the utility. Usually some dealer has a commitment to meet which prompts him to bid the full market and often to offer a premium. Quoted markets for non-ferrous items have been consistently exceeded for the past year or longer. There may be times when the prices quoted by dealers are too close and too low to be coincidental. Then all offers should be rejected, and the sale negotiated with a dealer outside the group.

Grading Recommended

3. Grading scrap, especially non-ferrous items, is recommended. Steel also should be graded unless the labor cost is prohibitive. There are wide differentials between the values of bare and insulated copper, insulated line wire and heavy insulated shop cords, red and yellow brass, heavy and light brass. Prices also vary considerably among the various forms of aluminum scrap. Steel has its price differentials, but its financial involvement is not so considerable. It is considered profitable, in ordinary circumstances, to grade it.

4. Scrap grading is an intricate matter, and its specifications vary depending upon the end-use to be made of the scrap. There is some legal opinion that a seller who regularly grades and sells according to grade descriptions may unintentionally guarantee his gradings and become legally responsible for variations. It is safer to sell scrap on the basis of "inspection and acceptance," or "as is, where is." Such bases commit the purchaser to accepting gradings whatever they are.

5. Some cleaning of non-ferrous scrap is profitable. Usually this is true when the percentage of copper or brass is high and foreign matter—steel, porcelain, or insulation—can be removed in a short time. But the cost of cleaning must be carefully controlled as it may result in no profit or even a loss. Each cleaning job should be carefully appraised before it is undertaken.

6. Facilities for speeding the handling or minimizing manpower in handling scrap can afford savings. Thought should be given to the widest possible use of pallets and pallet-boxes for the accumulation of scrap, beginning at the point of generation, and to the use of fork trucks and cranes for handling them. Electromagnets can handle steel economically when volume justifies the investment.

7. Correct weight is important. Consequently truck and railroad scales with their large tolerances should not be used for weighing nonferrous scrap. Many dealers have dependable equipment which can be used satisfactorily for all scrap except that which involves double handling. The most reliable and economical procedure is to install equipment at scrap centers and make all sales contingent upon weights established on it. Such equipment should be the best available; carefully installed; regularly inspected, adjusted, and tested; and well maintained.

Handle Big Units Too

8. Although scrap and salvage organizations devote much time to handling and selling scrap, they also handle the sale of generating plants and other multi-type installations also. These are often sold intact on the basis of "lumpsum" quotations.

Obtaining a proper return, however, is a difficult problem. A satisfactory sale probably depends upon the pooling of available information and experience. No such sale should be closed until full appraisal is made of the scrap value of the materials to be recovered. There is at least one case on record in which the value of such materials was more than three times the net amount of the highest offer received, with only an insignificant increase in labor for removal.

Much information can be gleaned from a study of original installation records and those covering additions and/or removals. Equipment manufacturers can add to it from their own records. Company personnel can contribute. When all data have been assembled, the quantities figured at prevailing scrap prices should give a fair estimate of the scrap value of the installation and permit evaluation of the best offer. Operating, construction, and engineering personnel should be used freely in establishing the appraised value of materials to be recovered. It should be remembered that a dealer stays in business by making a profit. Relying solely upon his own judgment and experience, he allows a considerable margin of safety. This usually means a quotation lower than what he feels is the real value.

Cooperation Essential

9. In marketing scrap, a utility deals with men of inherent shrewdness who know every small detail of their business. These men understand human nature and are quick to detect uncertainty or lack of knowledge. To compete with them, utility personnel must understand their own business and current market conditions. It is essential to satisfactory business relations that utility personnel hold dealers to strict compliance with any agreements they make. It is also important to make good any promises to a dealer.

10. Preventing any item from being scrapped that still has useful value is an important function of scrap and salvage operations. Many such items are sent to scrap and salvage centers. Careful inspection should be made of all materials and equipment, and steps should be taken for modernization or rehabilitation whenever these represent good economy. This calls for close contact and full cooperation between scrap and salvage forces and other departments.

Job for Committee

This cooperation can be brought about in different ways. One sure way, conducive to the desired result with the least effort in the shortest time, is to make a committee responsible for overall decisions on disposition. The committee should be made up of responsible personnel from various sections of the operating, engineering, purchasing, and stores departments. There should be representation from the salvage department when it is separately organized.

This committee should be subject to call whenever its services are required. It does its best work when the members are appointed by management. Its decisions should be accepted as final for all materials and equipment.

Fireproofing Preserves Line Over Marsh

TRANSMISSION—Maintenance

FRANK E. JOHNSON, Chief Operating Engineer, Distribution, New Orleans Public Service Inc, New Orleans, La.

Fireproofing preserved from damage by a recent fire several New Orleans Public Service wood structures of a 115-kv line traversing a marsh. Marshland fires are frequent in the dry seasons and have permanently damaged pressure-treated, creosoted-pine poles and cross members. After such fires, several structures must be replaced. Damage to two structures in one fire amounted to $1,224.

New Orleans Public Service uses a special spray technique for applying a patented material which looks like tar or bitumastic cement. To prepare structures for fireproofing, a glass-fabric cloth is stapled over sections of the pole where creosote has exuded. This affords proper adherence of the fireproofing material. Fabric is also stapled vertically to adjoining surfaces of two poles to make a "bridge" between the poles.

Sprayed 12 to 14 Ft High

The fireproofing material is sprayed about ⅛-in. thick on the poles to a height of 12 to 14 ft and on cross members several feet above ground for a distance of 4 ft out from the pole. Cross members are sprayed because experience has shown that they have been ignited by flying sparks, even at a distance of 3 ft from the pole.

The 5½-ft spray gun is the type used for applying heavy cement to roofs. It is connected to a pump inserted in a 55-gal steel barrel containing the fireproofing material. A gasoline-driven air compressor powers the pump. All the equipment is transported on a sled which can be dragged by a marsh buggy.

Before use, the fireproofing material was tested in the company's distribution yard. Large amounts of cane grass were compacted to a height of 6 ft around a fireproofed stub pole. When the grass was ignited, the structure caught fire and continued to burn even after the grass had burned out. This first test, however, was considered far more severe than any condition likely to arise in the field.

In a second test, somewhat more grass was piled around the stub than was likely to occur in one place in the field. When the structure had been fireproofed again, the grass was ignited. The results of this test were considered satisfactory.

In the fireproofing program, of the 115 structures in the marsh the 63 considered most susceptible to fire were sprayed. These ranged in type from the simplest two poles with two pilings to four poles with eight pilings.

Total cost of fireproofing 63 structures was $5,945, or $94.40 per structure. The first figure includes $2,567 for material, $3,203 for labor, and $175 for drayage to the site. Material used on the job included 16 55-gal drums of compound; 600 ft of 3-in. wide, 2,400 ft of 6-in. wide, and 1,200 ft of 12-in. wide glass cloth; and, 17 boxes of staples. Total manhours were 1,277, or 20¼ per structure, of which about 25% was overtime.

A marsh fire has since subjected several structures to a severe test. One structure's coating was blistered, but the blisters have remained firm.

Recoating the structure is not considered necessary at this time.

(*More How To on page* 134)

THE GENERAL ELECTRIC TSA-40

NEW TIME SWITCH—NEW LOW PRICE

Replacing Type T-27

TSA-40, an entirely new heavy-duty general purpose time switch, has been designed by General Electric to meet your demands for more reliable on-off operation at a lower price.

MANY NEW FEATURES make the TSA-40 a superior time switch for all heavy-duty, on-off applications. Exclusive contact shearing action gives you reliability and long life; new case, latch and cover gasket give complete weather-proofing; smaller size and more wiring space cut installation and maintenance costs; and extended operating temperature limits provide dependable service under a wide range of ambient conditions.

VERSATILE IN APPLICATION, the TSA-40 offers precise and reliable control of all types of street, sign, store window and floor lighting; capacitor switching; heating, air conditioning, and refrigeration; irrigation and pump control; and many other industrial and central station uses. The TSA-40 is fully suitable for both indoor and outdoor applications.

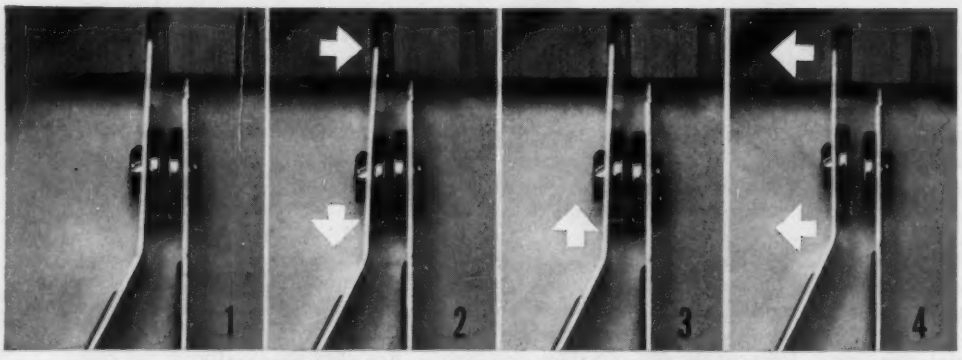
YOU GET EXTRA VERSATILITY when you order a TSA-40 with either or both of these optional features. The *omitting device* permits the TSA-40 to omit its operation on any day or days of the week. It can be added to a standard switch that is already installed. The *astronomic dial* is a special time dial which follows the changing schedule of sunset and sunrise in a particular locality. You save on cost of servicing because the need for regulating the time switch as the days grow longer or shorter is eliminated.

FOR PRICES AND FURTHER INFORMATION, call your nearest General Electric Apparatus Sales Office or write for Bulletin GEA-6468 to Section 584–4, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

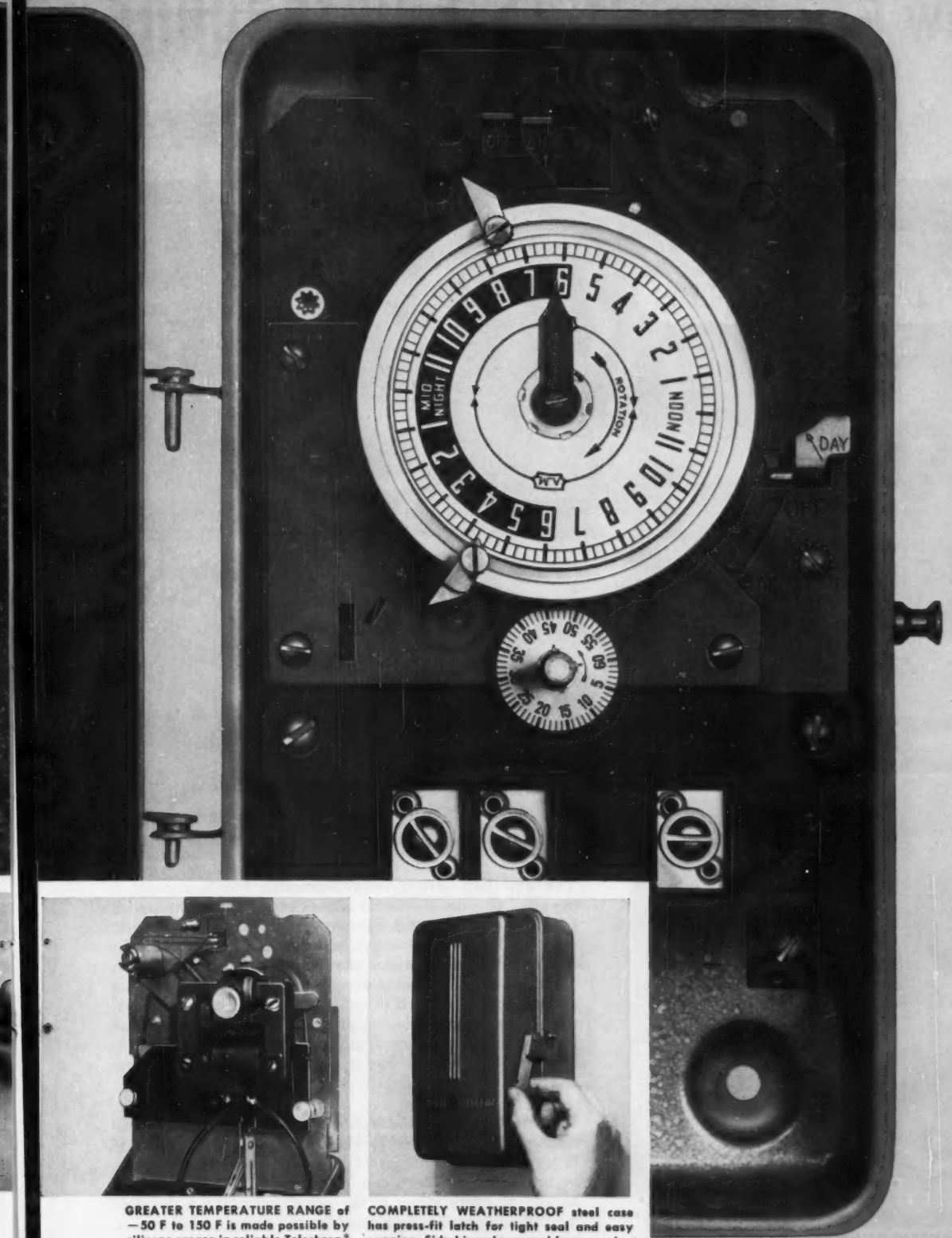
EXCLUSIVE CONTACT SHEARING ACTION GIVES GREATER RELIABILITY



WELDS ARE BROKEN, CONTACTS KEPT CLEAN BY THIS SHEARING ACTION:
(1) Contacts, shown here in closed position, are actuated by slotted bar at top of these actual photographs. At start of opening action (2), bar moves to right forcing left contact to move down with shearing action. As bar completes motion to right (3) contacts are released and spring blades cause second shearing action just before contacts snap open (4). Bar returns to first position ready for next operation.

NO WIRING BURNOUTS or "hot spots" because one-piece contact and terminal eliminate all internal wiring to contacts. Unit terminal block makes replacement easy.

ACTUAL SIZE



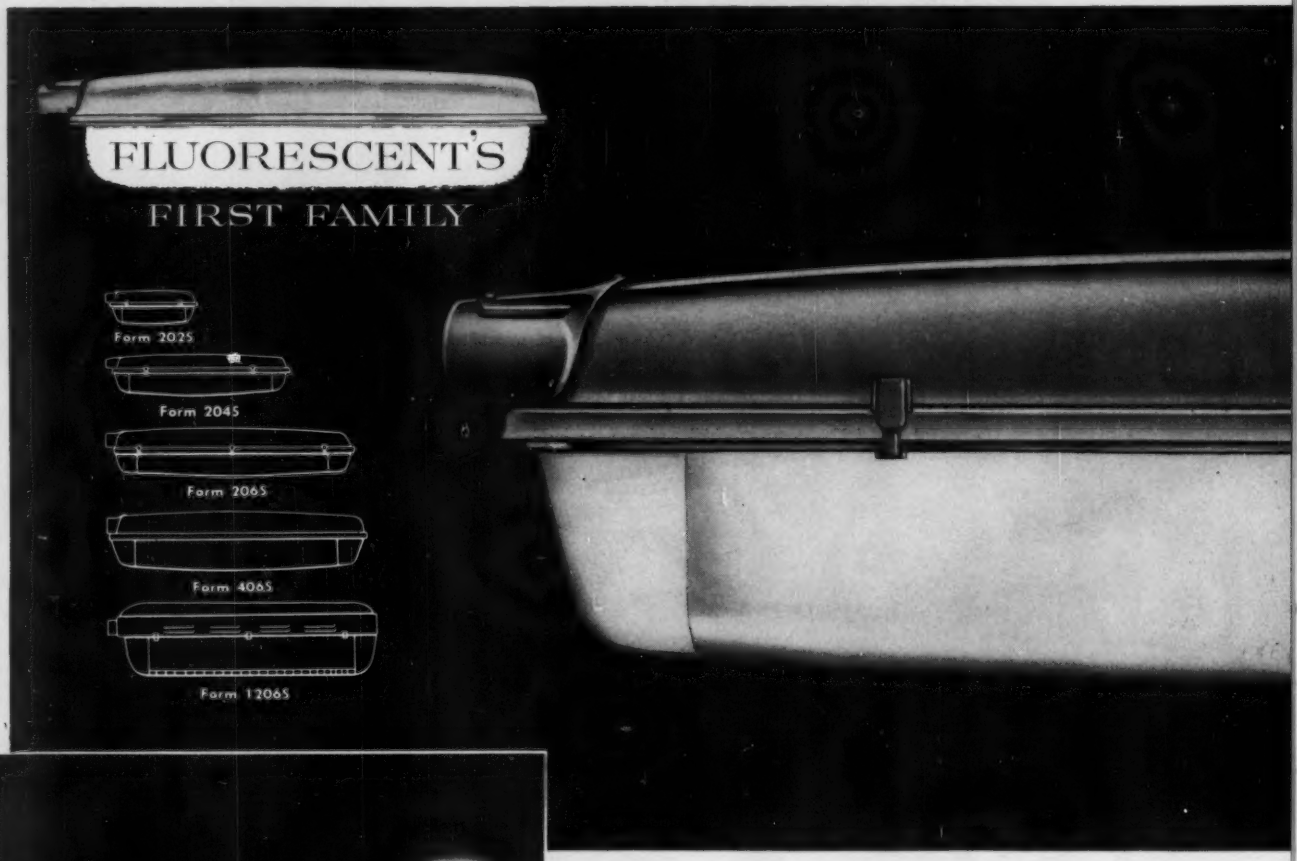
GREATER TEMPERATURE RANGE of —50 F to 150 F is made possible by silicone grease in reliable Telechron* motor. Direct drive of switching mechanism assures positive action.

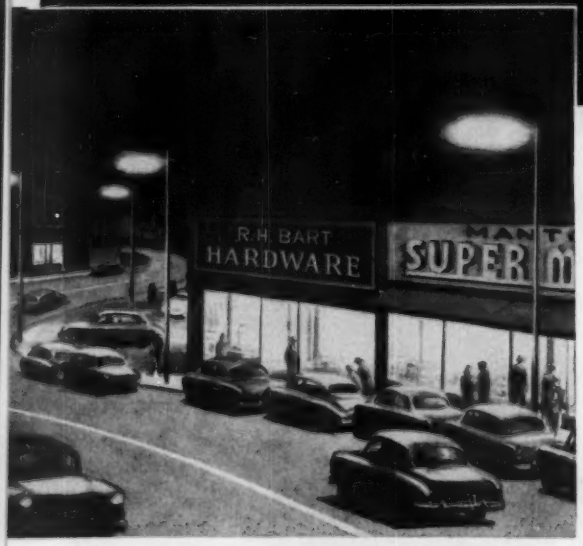
COMPLETELY WEATHERPROOF steel case has press-fit latch for tight seal and easy opening. Side-hinged removable cover simplifies installation and maintenance.

*Reg. trademark General Electric Co.

New G-E form 204S Fluorescent

improves visibility, promotes safety in





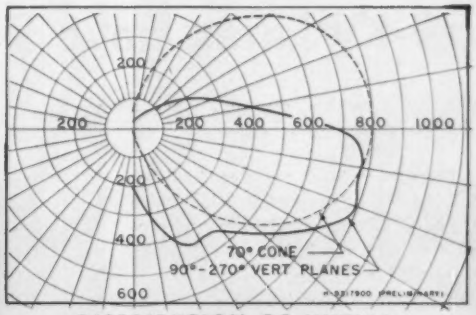
APPEARANCE PROBLEMS of satisfying both residential and business desires, without sacrificing the primary object of better street lighting, are easily solved by the modern appearance these luminaires give to any location.

The new G-E Form 204S Luminaire (6600 lumens) is designed to meet the needs of residential areas surrounded by light business and light traffic streets. The dangers associated with automotive and pedestrian traffic are as obvious as the importance of good street lighting. The soft diffused light over a wide area makes it easy for pedestrian and driver to see each other—minimum luminaire brightness practically eliminates glare. In addition, fluorescent lighting gives exceptional uniformity of pavement brightness—even when pavements are wet. This means greater safety and fewer accidents.

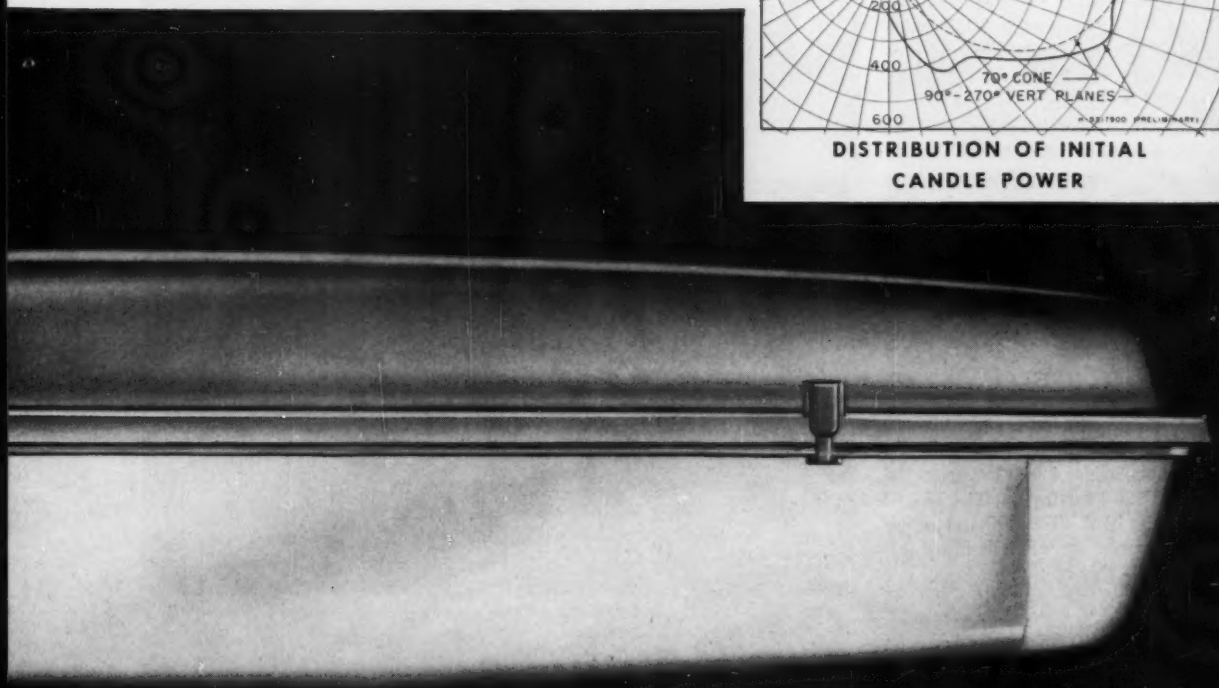
The Form 204S luminaire is another member of G.E.'s revolutionary family of fluorescents, now making it possible to bring all the advantages of this type of street lighting—better visibility, more comfortable seeing, lower maintenance—to every street in the community. It's a development made possible by a co-ordinated design of luminaires, lamps, ballasts and brackets for outdoor service. And each member of this family—whether it's the 202S (2700 lumens), 204S (6600 lumens), 206S (10,600 lumens), 406S (21,200 lumens) or 1206S (64,000 lumens)—contains many

Luminaire

secondary traffic areas



DISTRIBUTION OF INITIAL CANDLE POWER



new structural design improvements to assure installation, operating and maintenance advantages. Some of these advantages are slipfitter mountings, weatherproof engineering, one-piece side-hinged globe, detachable reflector, prewired terminal board, integral ballasts and new, recessed, double-contact-base lamps.

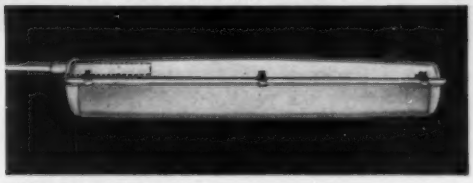
For more information on the outstanding new General Electric Form 204S or any other member of "Fluorescent's First Family," contact your nearest G-E Apparatus Sales Office, or write Section 452-163, General Electric Company, Schenectady 5, New York.

"Out of Darkness," a dramatic 16-mm sound film on how one community met and solved its street lighting problems, is available from your nearest G-E Apparatus Sales Office.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ONLY NEW G-E FLUORESCENT LUMINAIRES OFFER ALL THESE FEATURES



SLIPFITTER MOUNTING . . . pipe bracket slides easily into luminaire, giving perfect support and eliminating heavy, cumbersome clamp brackets. Simple, self-contained, two-bolt adjustment permits fast, easy leveling.

WEATHERPROOF ENGINEERING . . . new, resilient gasketing material between hood and globe provides a uniform, positive seal against all elements. One-piece plastic globe retains clear appearance in all weather.

69-Kv Lines Have 2-Step Capacitor Switching

J. S. WOODWARD, Substation Engineer, Public Service Co of Oklahoma, Tulsa

Capacitors in a two-step bank at the Hugo substation of Public Service Co of Oklahoma supply vars and provide voltage regulation on the 69-kv transmission system.

Connected 70 units per phase, the capacitors are switched in steps of 35 units per phase, plus five per phase in the auxiliary neutral in the first step, and 30 units per phase in the second step.

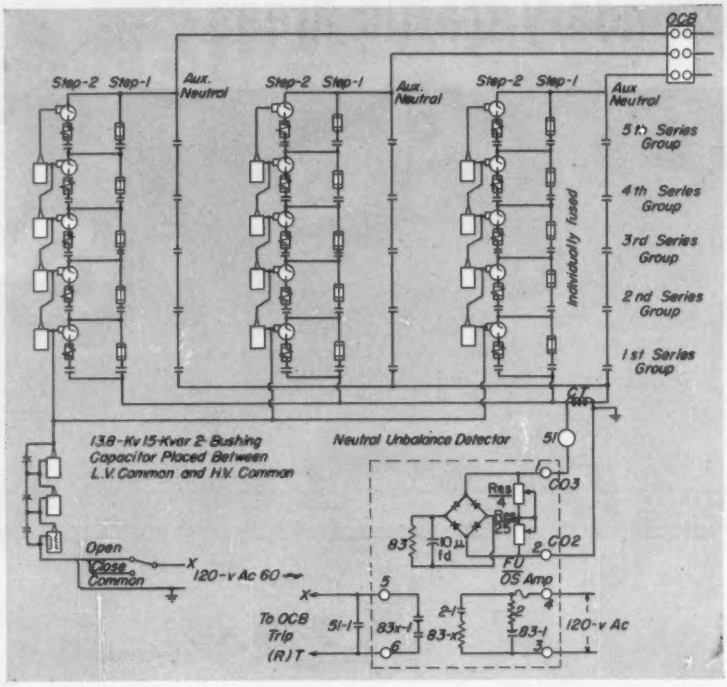
Individual capacitors are rated 7,960 v, 25 kvar. Phases are connected with five groups of capacitors in series per step. Each group has 13 capacitors, seven of which are switched in the first step and six in the second. Including 350 kvar in the auxiliary neutral, the first step switching provides 3,000 kvar, and the second 2,250 kvar for a total of 5,250 kvar in the bank. The 200-amp, pole-type oil switches were designed especially for this operation.

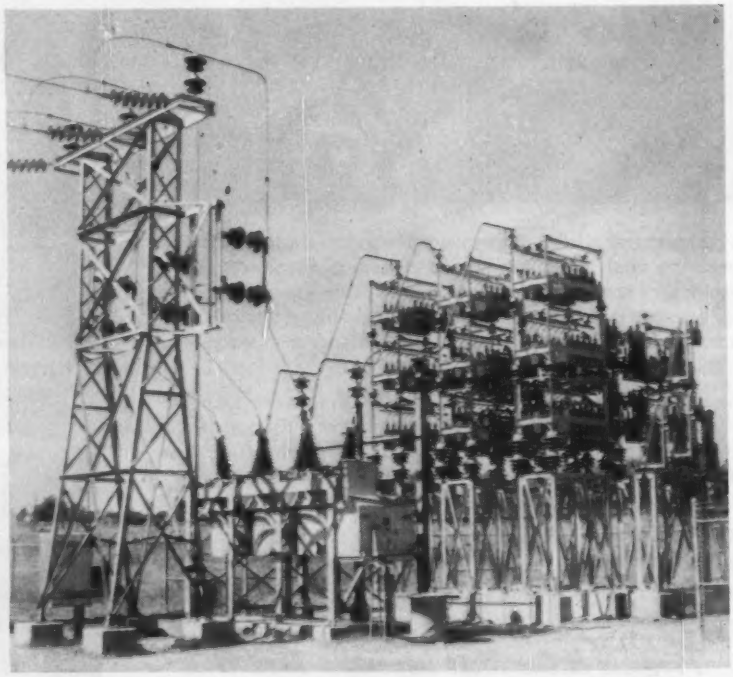
Control voltage operating the oil switches is cascaded through insulating transformers with a 120/120 transformer ratio.

The first step is the smallest kvar addition permitting failure of one capacitor without imposing continuous excessive voltage on the others in the bank. Auxiliary, separately hung, capacitors afford neutral unbalance protection. An auxiliary neutral assists in the detection of fault current, the neutral of this auxiliary source being connected through a 46-kv, 10/5-amp current transformer to both steps.

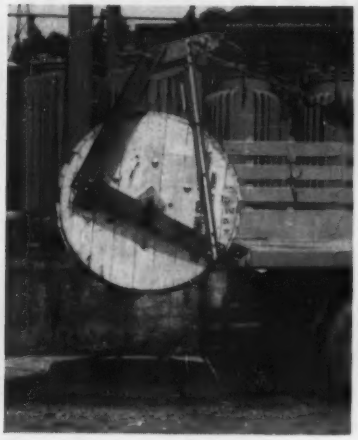
For proper operation of the unbalance detector, the neutral current caused by the inherent unbalance should not exceed 25% of the difference in current between the maximum allowable units failed and the maximum allowable plus one.

Physically, the bank has 15 prefabricated blocks of capacitors, five per phase. The blocks, though of standard, 16-unit design, contain only 13 units. Units are individually fused. Besides the 13 fused units per block, there is an unfused unit mounted on an insulated hanger on the side of the block leg, bringing total installed block capacity to 350 kvar.





TWO-STEP SWITCHING of capacitor bank at Hugo Substation provides Public Service Co of Oklahoma with voltage regulation on its 69 kv transmission system



TRANSMISSION—Construction

Enables Hauling Truck to Lift, Unload

W. PRICE CARTER, System Transmission Line, Superintendent, Appalachian Electric Power Co, Bluefield, W. Va.

A company-devised reel lift enables a small force of Appalachian Electric Power Co workmen to load or unload cable reels, using the same truck for the process as is used to haul them. This method contrasts with the usual procedure in which one truck with a derrick loads or unloads another which does the hauling. Thus the new method virtually halves cable transportation costs.

Designed by the author, the lift was converted to practical equipment by J. B. Doss, W. R. Massie, and R. T. Hypes from scrap channel iron, galvanized pipe, angles, and bars at a nominal expense in the company's system transmission line department shop.

Stops mounted on top of the side rails prevent the reel from banging against the truck edge and support the reel while it is being lifted onto the truck floor. In loading any reel, the lift should be stopped momentarily when the side rails supporting it are in a horizontal position so that the reel may be rolled toward the stop. Thus damage to the reel and its lagging are avoided.

Adjusted to Reel Size

Adjustment of these stops to different size reels is provided by a series of holes drilled in the upper surface of the channels. Square 4-in. busing spacers on the reel axle keep the reel bolts from hanging on the side rails while the reel turns.

During unloading, steps in the foregoing procedure are reversed.

The lift handles reels up to 72 in dia, weighing approximately 5,000 lb. Larger reels are accommodated by longer side braces and raising the space rods between the side rails to allow the larger reels to roll into and out of the lift.

When loading and hauling more than one reel, the reels should be rolled to each side of the truck body to leave space between them for the winch line. The last reel is left in the lift in readiness for unloading at the end of the haul.

The lift can be easily dismantled for transportation and requires very little space. Several lifts are now located at various points and are used by the System Transmission Line Department of the Southern Division.

Although the lift is considered effective in saving considerable set-up time, its design must be worked out carefully for maximum-weight reels; so that supporting members and winch line are not overstress.

GENERATION—Maintenance

Steam Cleans Transformer Water Coils Economically

HENRY RUTH, General Foreman, Hydro Maintenance, Shasta Division, Pacific Gas & Electric Co, Red Bluff, Calif.

Steam cleaning of transformer water cooling coils reduced labor more than 80% and costs 75% for Pacific Gas & Electric Co.

A high-pressure portable cleaner has replaced brushes and scrapers and eliminated the tedious hand cleaning method. Before cleaning by hand, the men had to separate and clamp the coils. It took five men three days to handle and clean a set of coils for each transformer.

With steam pressure at 120 lb and a special cleaning compound, two men do the job in a day. Coils are not separated, but still must be removed from the transformer and set on a truck.

Hand cleaning of coils from ten transformers costs $1,800. The cost is $440 with steam. A steam cleaner is kept now in the company's revolving stock and is used by all divisions for cleaning bearing and governor oil systems also.

(*More How To on page* 144)

FIRST TO BE MOLDED IN NEW HY-BUTE ⚡60* INSULATION

ACTUAL SIZE

G.E.'s New 15-kv Instrument Transformer Mounts Easily; Needs Less Maintenance

LIGHT AND MORE RUGGED, TYPE JKW-5 MOUNTS IN ANY POSITION

General Electric's discovery of an internal oxidation mechanism which can be added to ordinary butyl to prevent arc-tracking now makes feasible the molded construction of outdoor current transformers in the higher voltage ranges. This new compound, Hy-Bute/60 insulation, gives you seven big advantages in the new type JKW-5 15-kv instrument transformer.

NEW JKW-5 REPLACES 3 TRANSFORMERS because it can be mounted in any position. It supersedes the bottom, top and side-connected designs. This simplifies stocking and maintenance problems.

CORROSION-RESISTANT materials—new Hy-Bute/60 insulation, stainless steel and copper—virtually eliminate necessity for maintenance.

WEIGHS 20% LESS than older type, top connected transformer of the same rating.

SMALLER SIZE coupled with lighter weight makes the General Electric JKW-5 easier to install. The new transformer, shown here in actual size, measures only 15¾ inches high, 10⅞ inches wide and 9½ inches long.

NO PORCELAIN BUSHINGS to crack because new Hy-Bute/60 serves as bushing, insulation and case on the new JKW-5. This feature removes possibility of failure which might occur as a result of thermal shock or external damage to porcelain bushings.

SAFER OPERATING, General Electric's Hy-Bute/60 insulated transformers cannot explode or catch on fire like older types.

LONGER LIFE is assured because Hy-Bute/60 insulation is mechanically tough, chemically inert, heat resistant, impervious to severe weather conditions and has high dielectric strength.

YOU GET SIMILAR BENEFITS IN OTHER MEMBERS OF G.E.'S BUTYL FAMILY

JKW-3 5-kv current transformer is available for outdoor applications

JKM-5 15-kv current transformer for indoor applications

JCP-0 600-volt current transformer for high-current indoor/outdoor applications

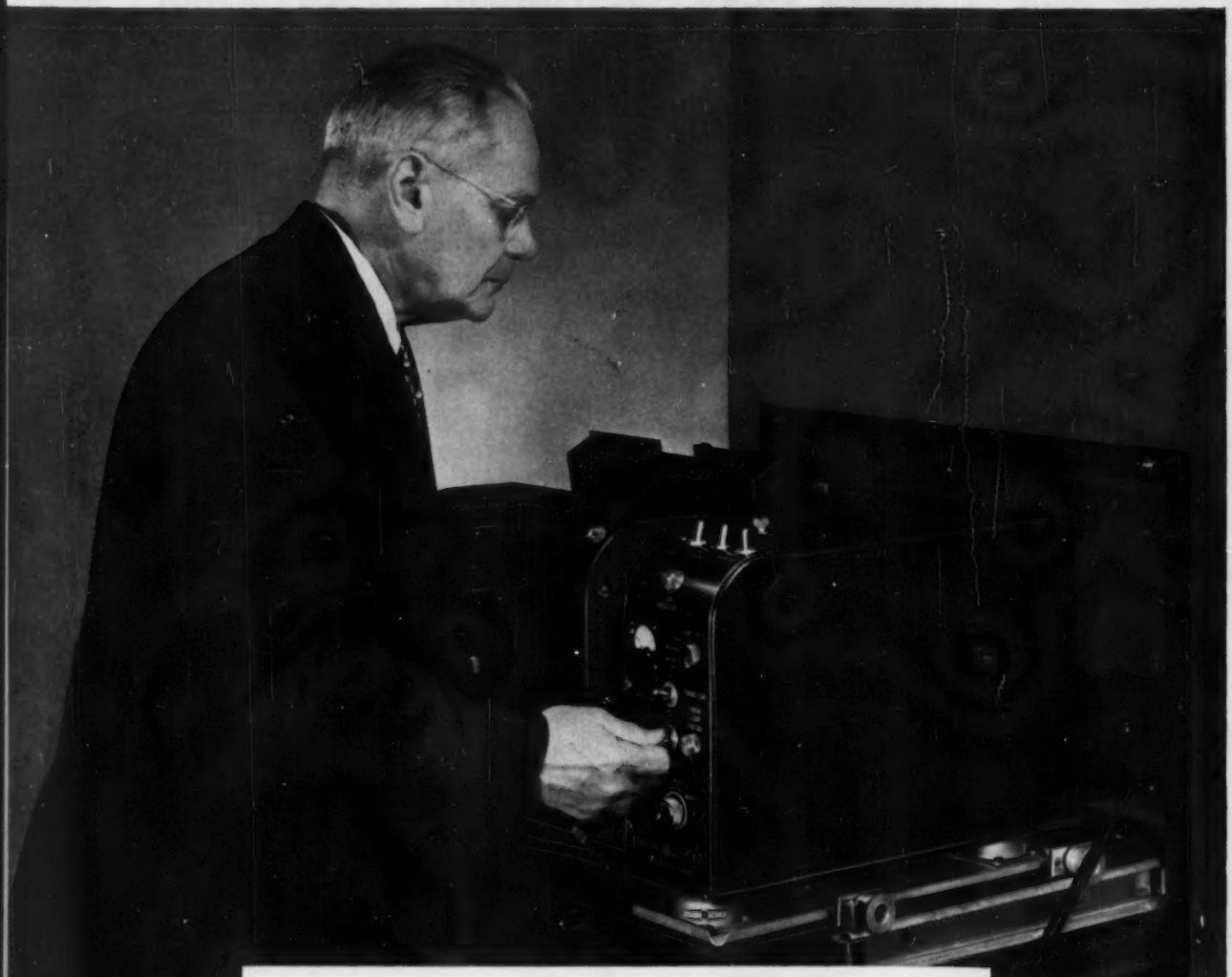
For more information about the new JKW-5, contact your nearest G-E Apparatus Sales Office or write for Bulletin GED-2727 to Section 581–2, General Electric Company, Schenectady 5, New York. For information about General Electric's complete line of instrument transformers, request Bulletin GEC-1028. 581-2

*Trade-mark of General Electric Co.

GENERAL ELECTRIC

GENERAL ELECTRIC ANNOUNCES

22-Channel Oscillograph; Provides



PM-21 Oscillograph's Roll-out Chassis Saves Time, Reduces Cost of Operation and Maintenance

With the PM-21's exclusive roll-out chassis, you just ROLL OUT THE OSCILLOGRAPH—the sides, rear, and all parts are readily accessible for quick, easy operation and maintenance. Roll it in and the oscillograph is conveniently out of the way and protected by a metal door. A trouble light and operation counter show on the door.

ALL CONNECTIONS ARE IN THE REAR of the oscillograph, and quick-disconnect-type connectors permit easy removal for general-purpose use.

FOR MORE INFORMATION, contact your nearest G-E Apparatus Sales Office or write for bulletin GED-3049 to Section 585-32, General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC

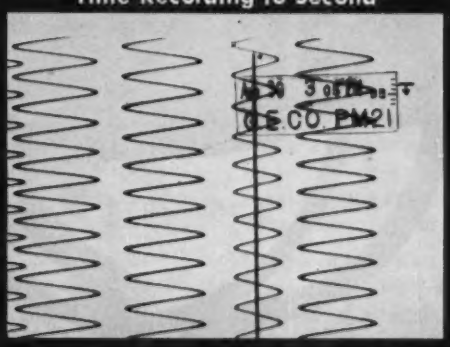
New Versatility, Economy Features

Fully-automatic Oscillograph Answers Utilities' Need for Greater Galvanometer Versatility, Easier Maintenance and Service, and Quick Change to General-purpose Use

22 Channels

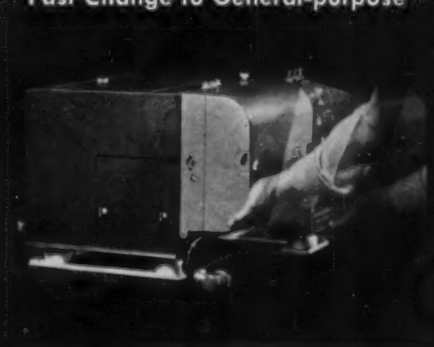
GREATER GALVANOMETER VERSATILITY is provided—holds from 1 to 22 bifilar galvanometers, or 11 to 18 bifilar plus 14 to 60 pencil-type galvanometers.

Time Recording to Second



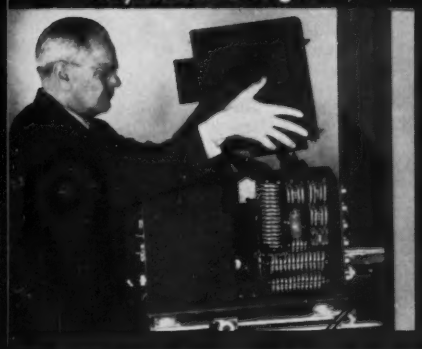
NO DECODING IS NECESSARY, and you get time recording to the second at the end of each record. A station identification nameplate can also be added for photographing on the record.

Fast Change to General-purpose



FOR STAGED TESTS, replace automatic record-paper holder with general-purpose holder to get continuously variable paper speeds of 4–500 feet/min.

Easy-access Design



QUICK ACCESS TO ALL VITAL PARTS is provided by hinged doors in the case. For complete access, loosen 3 fasteners and entire cover can be removed.

Easy Access to Lamps

LAMPS ARE EASILY ACCESSIBLE for replacement. Remove record holder, and lamp holders swing out for simple removal. Anyone can replace lamps since no optical adjustments are needed.

Separate Paper Holders

2 PAPER HOLDERS (lower for exposed; upper for unexposed) allow removal of lower holder to darkroom. A spare replaces it for continuous operation.

Progress Is Our Most Important Product

GENERAL ELECTRIC

DISTRIBUTION TRANSFORMERS

THESE BRACELETS

COULD SAVE YOU...$210

Estimate your possible savings in terms of all transformers on your lines

Sometimes an ordinary transformer cover warps from uneven pressure because of careless tightening of clamps or bolts. If the cover has the usual cork or cork-and-rubber gasket, air can leak in. In one recent case-history moisture accumulated in the tank in less than a year, causing a short circuit between tank and windings. The failure cost $210 for the service trip and replacement of the 5-kva, 2400-volt unit.

G-E cover design prevents this problem. The one-piece stainless-steel clamping band and Nitrile rubber gasket on a G-E transformer maintain a tight seal for the life of the transformer. The band is tightened with only one bolt—pressure is thus uniform around the rim. The gasket resists air and oil, and continues to exert "back" pressure against rim and cover. Similar one-piece stainless-steel bands and Nitrile gaskets are used for bushings and hand hole covers. Factory sealing is thus maintained permanently.

Gaskets and bands are easy to remove. The Nitrile gaskets, furthermore, require no cement and can be used over and over again.

Look at the other money-saving features that prove "All Transformers Are Not Alike": **Impulse testing,** for instance, saves years of transformer life. **AL/CU terminals** are designed to prevent both copper and aluminum conductors from loosening. **Strenicor terminal clamps** save terminals from breaking. **Super Melaglyp paint** saves up to two repaintings. **Nationwide warehouses** save utilities heavy inventory expense. **Service shops** can cut your repair and rebuilding costs.

For the complete story, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431-35, Schenectady 5, N. Y.

dollar-saving features prove ATANA*

*ALL TRANSFORMERS ARE NOT ALIKE
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

Progress Is Our Most Important Product

GENERAL ELECTRIC

Unloading Poles Safely from Railroad Cars

C. B. YEAROUT, Assistant Division Personnel Supervisor, Appalachian Electric Power Co, Bluefield, W. Va.

Preliminary, operational, and final steps are listed as a procedure to unload poles from railroad cars safely.

• **Preliminary Steps**

1. Have necessary equipment on hand in good condition, including slings, snatch blocks, cant hooks, pike poles, axe, bolt cutters, skids (see sketch E.), stakes, and truck with winch having at least ½-in.-6x37 plow-steel line.

2. Have minimum of four men for unloading.

3. Have crew include supervisor, truck driver and two other experienced men.

4. Instruct men on general problem and precautions.

5. Spot railroad car at proper position.

6. Apply car brakes and check wheels.

7. Inspect car, load, and surrounding area for unsafe conditions.

8. Spot truck in safe location, parallel with track if possible, where it will not be in path of pole movement.

9. Set truck brakes and block wheels.

10. Make inspection for safety before each of the operations I-VI.

• **Operational Steps**

I. Thread winch line through end and middle snatch blocks with hand line, and dead-end the winch line securely as indicated. Secure the tackle to stake pockets with at least two turns of ½-in. wire-rope protected against cutting and the hook openings moused. See sketch A.

II. Pull up slack in winch line by hand, adjust tackle, and tighten line with truck winch. Check winch line tension preferably by a dynamometer. Add additional stakes in pockets on "safe" side of car, far side of sketch B.

III. Hook skids securely in stake pockets on unloading side. With bolt cutter, cut binding bands on all except end stakes on "safe" side. Bands binding the end stakes should not be cut until operation IV.

IV. Deeply notch each stake near pockets on unloading side. On "safe" side, cut remaining stake bands with bolt cutters.

V. From ground on "safe" side, use bolt cutters, to cut bands binding load in following order: 1-middle; 2-end band furthest from truck winch; 3-band nearest truck. See sketch C.

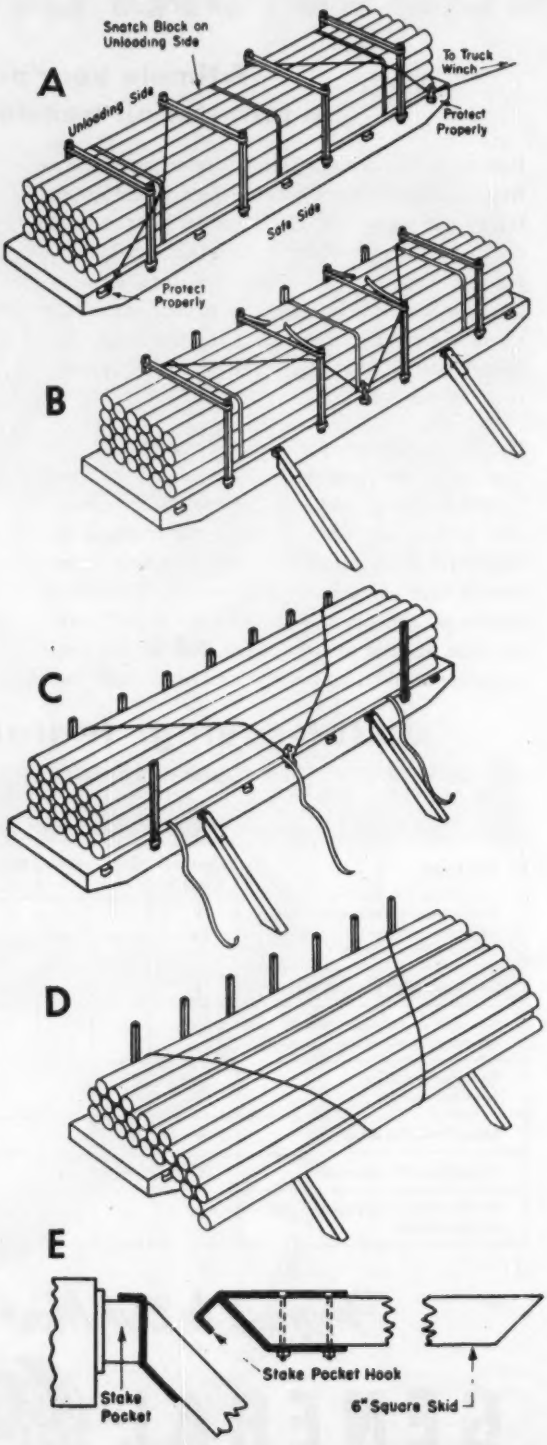
VI. See that everyone is in a safe position before signaling truck driver to slacken winch line. See sketch D.

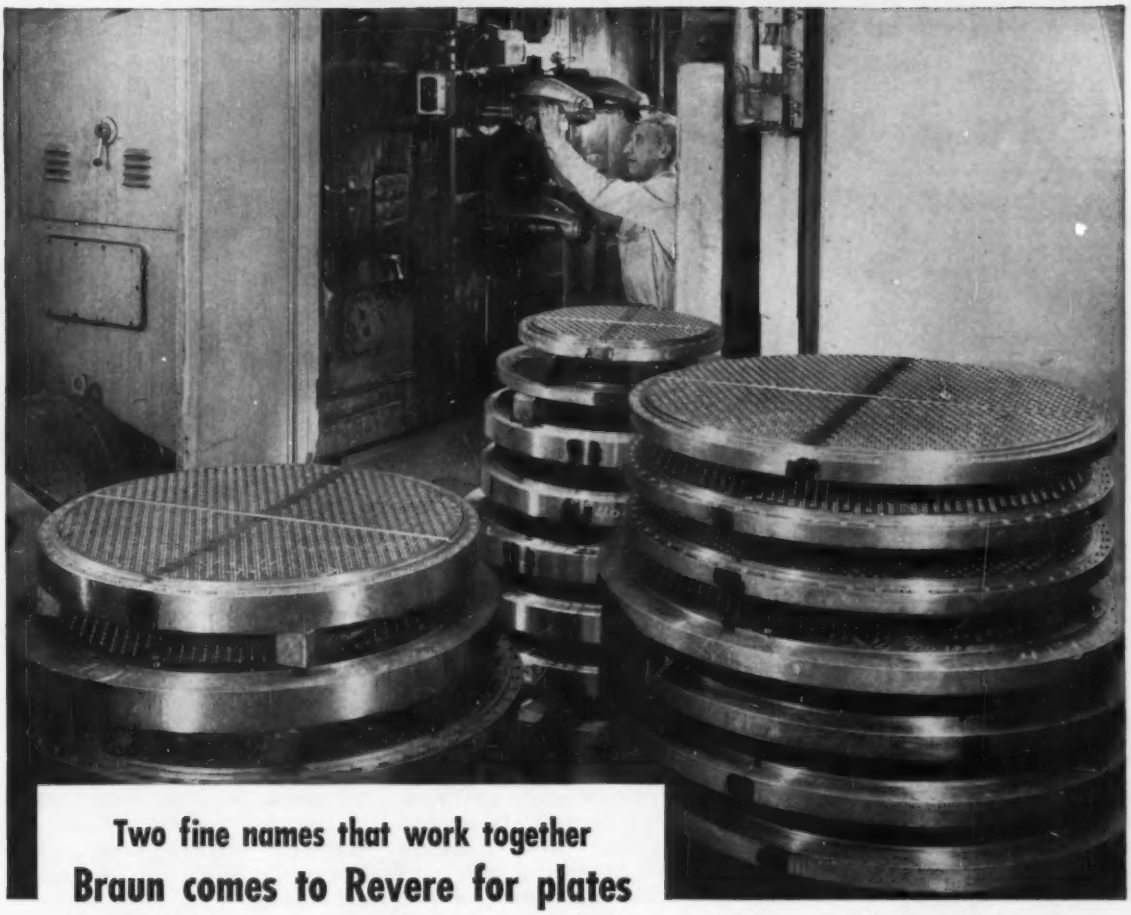
• **Final Steps**

1. After poles have been eased down to a resting position, make inspection from safe position to detect any "cocked" poles or any in crossed positions. Move them with a pike pole.

2. After poles are in safe positions, slacken winch line completely, unfasten its end, and pull free from snatch blocks with winch.

3. Remove poles from railroad right-of-way, and store them safely according to classification. Good housekeeping helps maintain a safe pole yard.





Tube sheets at 4-spindle automatic drill in Braun shop.

Two fine names that work together

Braun comes to Revere for plates

C. F. Braun & Co., Alhambra, Calif. is well known in the petroleum industry, the chemical industry, and other businesses in which heat transfer and fractionation are vital. Revere Copper and Brass Incorporated is well known in the non-ferrous metal industry for its tube sheets and plates, in all the customary alloys. What is more natural than the close relations between the two companies, Revere the supplier, Braun the fabricator? Revere can furnish heavy plates when needed; Braun is one of the great heavy-duty shops of the country. So far as transportation limits permit, Braun fabricates in its own plant; their machines and their cranes can handle anything the railroads can haul away. The same is true of Revere, which is likewise known throughout heavy industry for its ability to produce not only large plates, but also condenser and heat exchanger tubes.

Revere is pleased to be an important supplier to Braun. Remember, good names find it good business to come together. The next time you want quotations on tube sheets and plates, and condenser tubes, get in touch with the nearest Revere Sales Office.

A Braun engineer inspects a drilled tube sheet.

REVERE

COPPER AND BRASS INCORPORATED

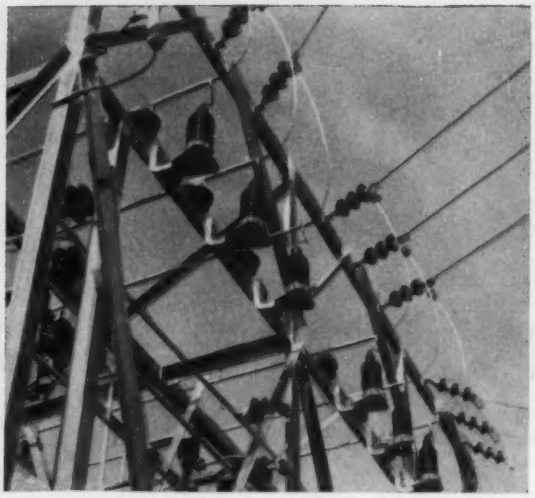
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N.Y. Sales Offices in Principal Cities, Distributors Everywhere.

HIGH-VOLTAGE STRUCTURE was prefabricated in sections on the ground, and sections were lifted into place by derrick



DISTRIBUTION FEEDERS loop down into compression sleeves welded to extra-heavy 1-in. IPS aluminum used as bus work

Aluminum Favored for Distribution Substation

FRED H. LEHMAN, Chief Engineer, Clark County Public Utility District, Vancouver, Wash.

An all-welded, all-aluminium alloy substation, designed for 10,000 kva, 69 kv delta/12.45/7.2 kv wye, has been placed in service by Clark County Public Utility District. Aluminum alloy structures were used because of:

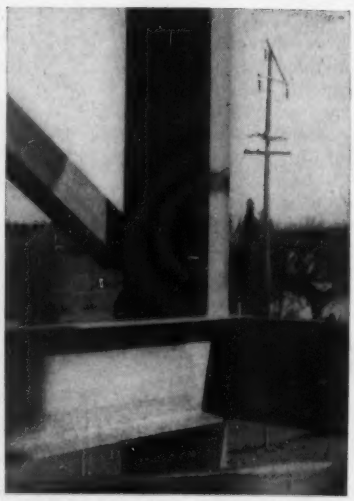
1. Ease of cutting and assembling.
2. Less engineering detail.
3. Elimination of rust and corrosion problems.
4. Favorable initial cost of lower expected maintenance cost.

The substation consists of a 69-kv structure which supports a limited-tension deadened span, 3-pole gang air break switch, fused cutouts, and arresters. The 12-kv structure has a station-type bus regulator, three oil circuit breakers, and a transfer bus. It supplies three distribution feeders.

Members Field Cut

Structural materials are 40,000-psi yield strength 6061-T6 alloy; bus work, 6063-T6 with 55% conductivity; and bolts, 2024-T4 with 60,000-psi yield strength for attaching insulators, switches, and other equipment. Oxide-inhibiting pastes were applied where galvanized parts contacted the aluminum.

Conductor design tension was limited to 1,000 lb per conductor on the high-voltage and 600 lb per conductor on the low-voltage side. Vertical members on the 69-kv structure are 8x2.527-in., 6.47-lb/ft channels with 3x3x⅜-in. structural angle bridging. Horizontal members for walk ways, top section and cut-out supports are 7x2.194-in., 4.23-lb/ft channels with 4x4x⅜-in. structural angle bridging. Bus work on both high and low sides consists of extra-heavy 1-in. IPS tubular aluminium. Low voltage structure has primary members of 4x4x⅜-in. structural angles and 3x3x⅜-in. structural angles for braces and bridging.



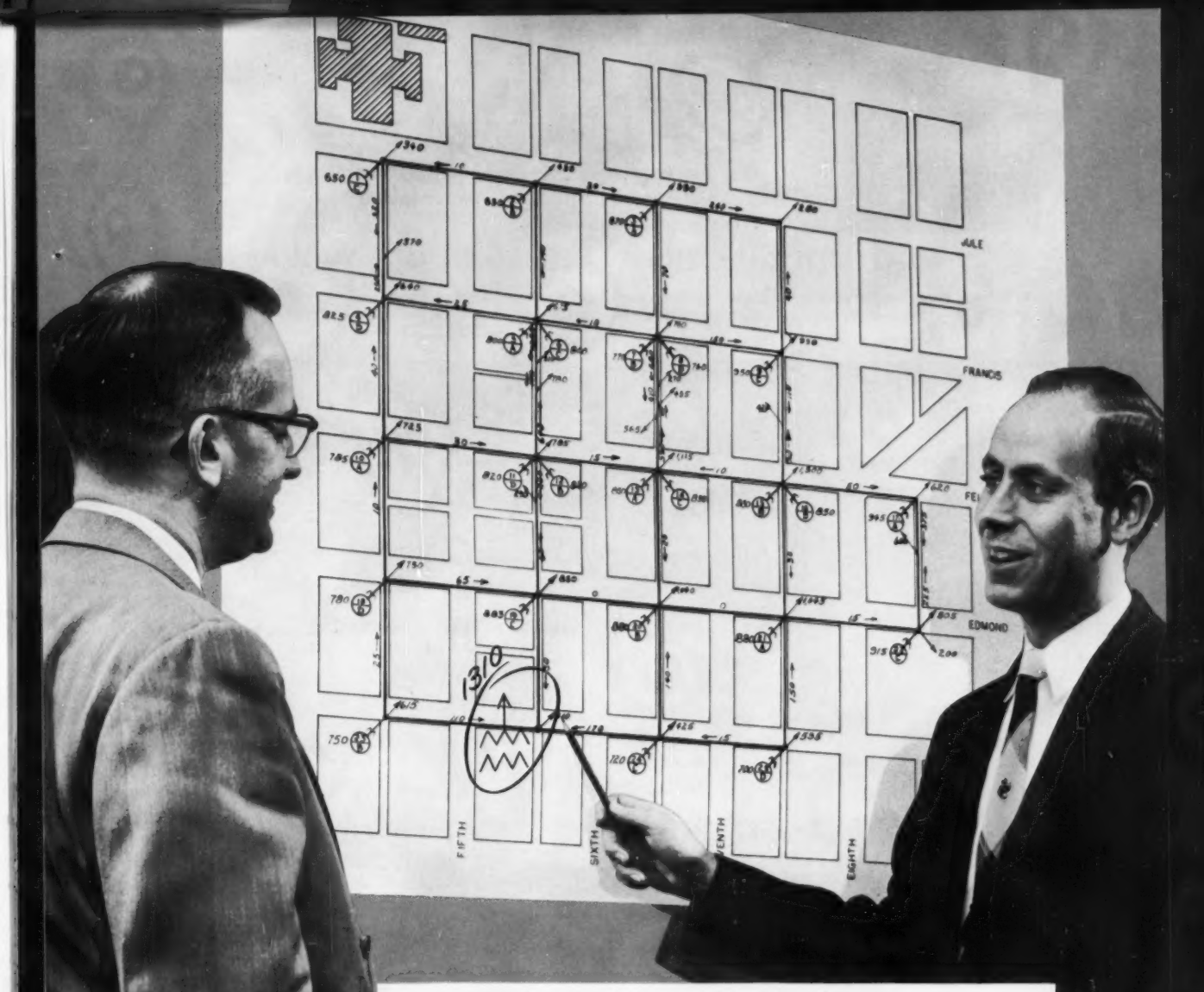
VERTICAL MEMBERS of the 69-kv structure are channels of 6061-T6 alloy

Members were field cut and assembled, with all drilling done at the site. An ordinary carpenter's portable hand saw with a 7¼-in. hardwood flooring blade cut the aluminum. Butt welds and severed welds were dressed down with a lead file. In drilling bolt holes, ⅛-in. pilot holes were drilled first because otherwise the larger drills had a tendency to drift.

An argon-shielded arc welder with consumable electrode provided a very fast welding operation with very good penetration of the parent metal. Test welds showed a high degree of ductility, and no welds developed cracks or failed after erection.

During construction, as much of the structure as possible was fabricated on the ground, with a flat bed of timbers as a work surface. For the high-voltage structure, the end, walkway, cutout, and top sections were fabricated, lifted into place and welded together. It was most desirable to minimize the number of aerial welds, because it was necessary to shield the

(*Continued on page* 153)



Good news from Westinghouse . . .

To help you solve network system problems

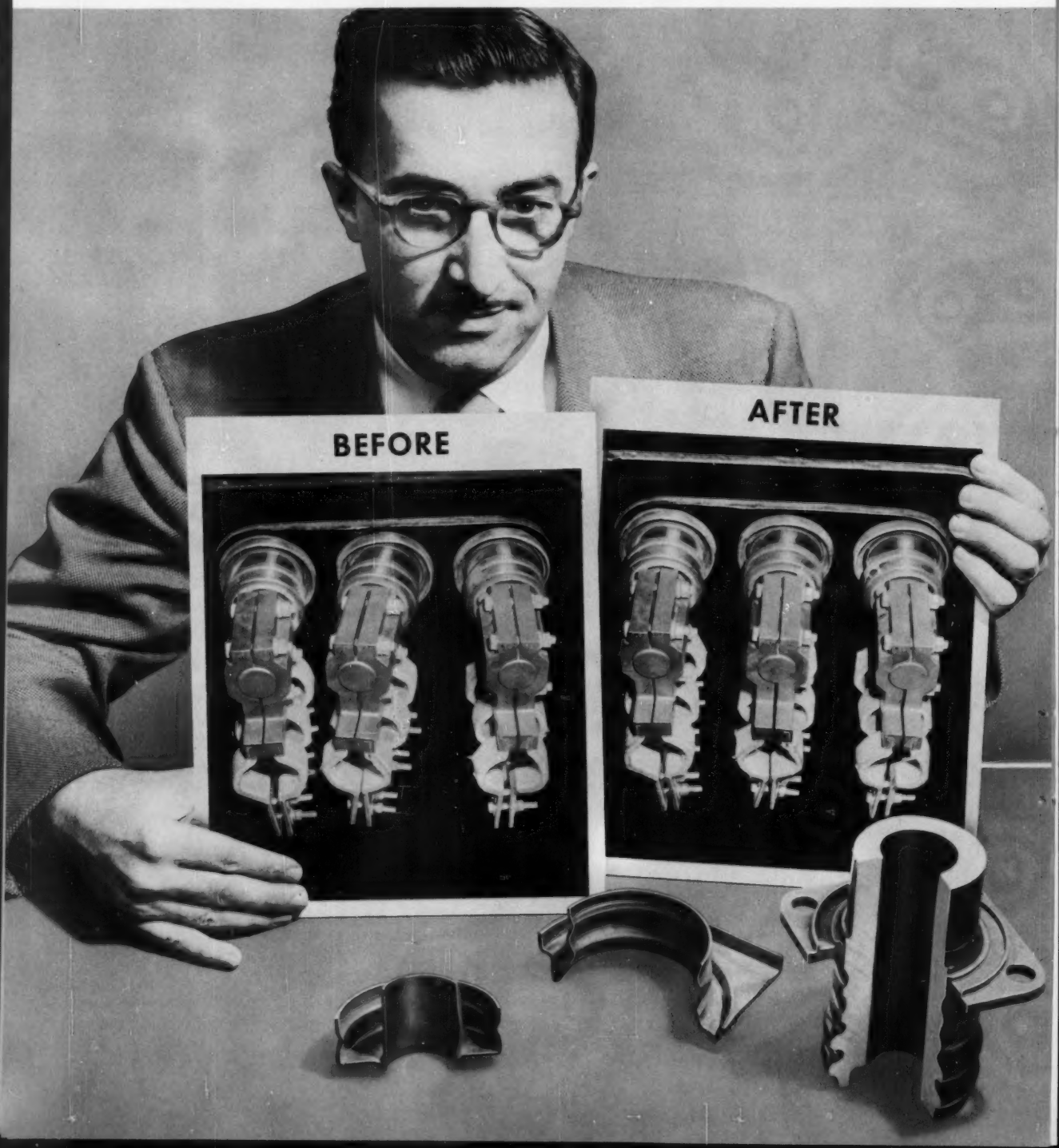
Changing times—changing patterns of working and living—create continuous problems in the operation of networks. Every day, utility executives and engineers come to grips with such diverse problems as maintenance, expansion needs, a broad variety of load densities, zoning and rights of way.

By virtue of experience dating back to the first installations, plus a complete line of network apparatus, and engineering service, Westinghouse is prepared to help you solve network system problems. On the next 7 pages, R. F. Lawrence, Westinghouse Distribution Engineer, cites typical examples.

Westinghouse

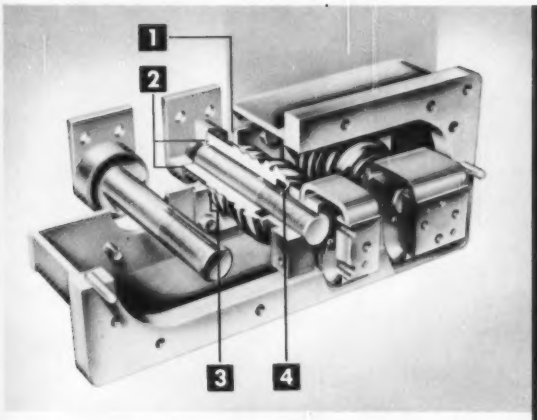
"Bushing leakage on network transformers has been a long-standing industry problem. V. H. Hahn, Network Transformer Sales, explains how Westinghouse solved it."

V. H. Hahn points out the displacement of a new RFW bushing that was damaged in shipment. Even after the studs were forced back into position, they remained leakproof . . . no permanent damage.



problem: **Getting leakproof bushings for network transformers**

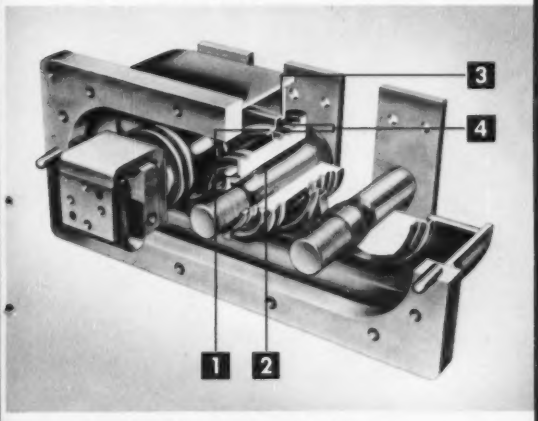
solution: **New double-seal rolled-flange bushings**



Type RFG low-voltage bushings for network transformers

1. Tank-to-bushing seal: retained Cortite gasket
2. Stud-to-bushing seal: retained Cortite gasket
3. Rolled seal: silicone (Silastic*) rubber
4. Stud and porcelain interlocking washer

*® *Dow Corning Corp.*



Type RFW low-voltage bushings for network transformers

1. Copper-to-copper inert arc welds
2. Sealing sleeve permanently brazed to stud
3. Copper bushing plate brazed to tank wall
4. Silicone-rubber rolled seal

A radical new bushing design . . . 1200 already in service, without a single instance of leakage! That's the record to date.

The leakproof qualities of the new design were dramatically, if unintentionally demonstrated when a 1000-kva 3-phase network transformer was damaged in shipment to Consolidated Edison of New York. The photographs, on the opposite page, show the severe displacement of the low-voltage bushings. Jacks were used to force them back into correct alignment. Although they had undergone severe shock of impact and the strain of straightening, the bushings remained leakproof . . . when straightened, were as good as new.

The new Westinghouse Type RFW (rolled-flange, welded) low-voltage bushing has the metal sleeve of the flange double-rolled into the contour of the porcelain over silicone-rubber rings. This assures resilience, yet creates a permanent bond. The conductor is sealed to the insulator at the outer end, and the bushing into the tank, by inert arc welding. The result is a hermetic seal without gaskets.

For applications where bolted bushings are preferable, Type RFG (rolled-flange, gasketed) can be furnished. Here the stud is sealed to the insulator, and the mounting flange to the tank, by Cortite* gaskets. A recess in the flange makes uniform gasket compression positive.

Either style assures a complete oil seal that is rugged, resistant to mechanical and electrical shock—one more safeguard to the high quality of performance designed into Westinghouse network transformers.

*Trade-Mark

YOU CAN BE SURE...IF IT'S

Westinghouse

"Built-in flexibility—such as Westinghouse network protectors and unit substations—helps relieve the system strains caused by load growth."

E. Stohr, Design Engineer, shows a newly developed plate with ammeter jacks that can be used on all CM-22 and CM-44 network protectors. This simplifies periodic checking of changing load density patterns.

problem: Handling commercial area load growth

solution: Protectors that keep pace with the need

The Westinghouse line of automatic network protectors is well fitted to the dual role of meeting change-over or expansion requirements . . . without penalizing quality or reliability of service.

The CM-22 heavy-duty protector . . . in submersible or ventilated dry-vault types . . . is designed for service in heavily loaded areas. The CM-44 . . . in submersible, dry-vault or weatherproof, pole-mounted types . . . is for locations of medium load. And for light-density areas, the CM-88 is ideal.

In addition to meeting any variant of service, Westinghouse protectors help you save on investment as system changes are made. The CM-22 readily replaces the CM-44 when loads increase, without upsetting system coordination—the relays are identical. The replaced protector can be moved to lighter loads.

Extending low-cost network protection in new or growing outlying areas is a simple matter . . . the outdoor, weatherproof CM-88 mounts on poles like a transformer.

Controlling all Westinghouse protectors is the high-torque CN-33, 3-phase induction master relay . . . sturdy, compact and dependable, long wearing.

problem: **Fitting the power supply to the load**

solution: **Long-term flexibility in unit substations**

Three *standout* advantages protect your investment in Westinghouse unit substations.

First, coordination in design and manufacture. Equipment components are engineered and factory-assembled to work together in a convenient, dependable arrangement. Design, engineering and manufacturing are the sole responsibility of one experienced organization.

Second, a Westinghouse unit sub provides the physical and electrical flexibility that marks it a system investment with a future. The unit sub not only helps you bring distribution close to load . . . a saving in itself . . . but helps you accommodate changes in load density on short notice. Transformers can be changed—and quickly. When load grows or shifts, an entire substation may be moved with minimum service interruption, with 100% equipment salvage.

Third, unit subs are compact and attractive in appearance, which means minimum real estate investment, less likelihood of community restrictions. Location of stations for efficiency, expediency and acceptance is an easier problem with Westinghouse equipment.

Westinghouse unit substations are a practical, economical, long-term investment. The facts speak for themselves.

YOU CAN BE SURE...IF IT'S

Westinghouse

This unit substation is a good neighbor, points out G. Metzler, Manager, Unit Equipment Sales. Not only neat and attractive, this Westinghouse unit uses a minimum of space, and features the completely safe dead-front construction.

"Here's the quickest and most economical solution to the headaches brought on by overloading of networks: specially designed Westinghouse network capacitors and equipment."

problem: **Overloaded network transformers**

solution: **Network capacitor . . . inexpensive, submersible, easily installed**

There is no faster, less expensive way of raising network capability, when you're faced with both overload and decreased power factor, than with Westinghouse network capacitors.

At far less cost, network capability can be improved with the new Westinghouse 13½-kvar, 216-volt secondary capacitor than with installation of larger transformers or network protectors. Studies have shown, for example, that application of an 80-kvar capacitor bank with a 500-kva transformer may produce a usable load-capacity gain of up to 11% at 85% power factor. An installed cost of $46.00 for the capacitors results in a gain of one kva of network capacity.

Specially designed for underground use, the Westinghouse capacitor will operate in 55°C ambient temperature. The steel case is protected against corrosion by a heavy coat of zinc, covered by an organic paint finish. Even when subjected to salt water immersion these units last many years, and in dry vaults, 25 years—maintenance-free. The capacitor is equipped with a newly developed current limiting fuse to remove any short-circuited unit from the line before the case can rupture, even under high fault current.

Because of its compact design, the Westinghouse network capacitor requires little space . . . this may be a decisive factor when considering existing vault area. Capacitors may be ordered singly, or as factory-assembled and wired racks in multiples of three (40, 80 or 120 kvar). These racks can be mounted on floor, wall or ceiling.

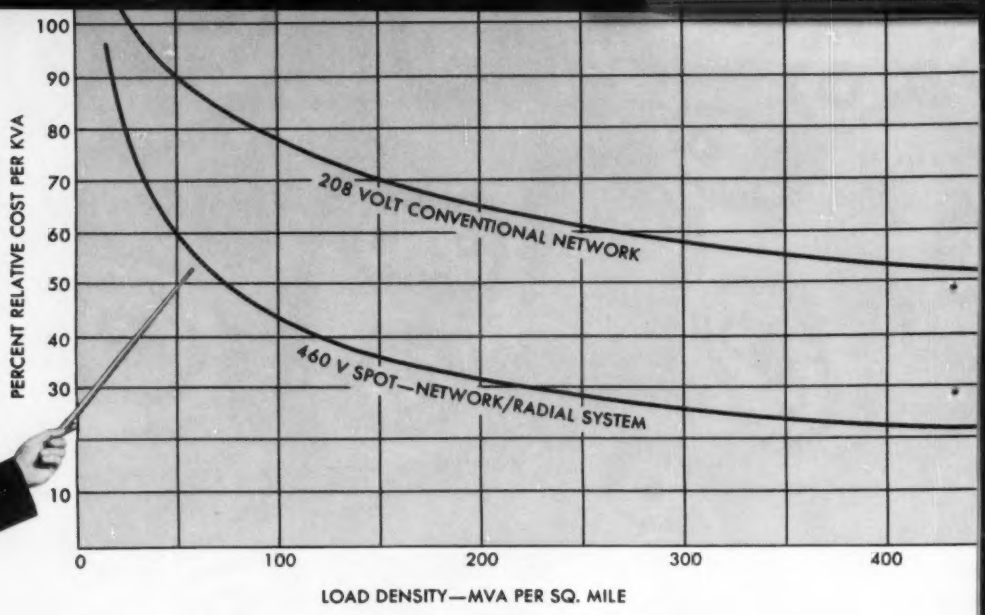
Basic electrical reliability is paramount in the design of network capacitors. Specify Westinghouse for an easier and more economical way to buy, apply and install them.

H. Brooks, Supervisory Capacitor Engineer, points out how the special neoprene sleeve waterproofs and insulates both fuse and terminal connections of Westinghouse network capacitors.

This Westinghouse network capacitor equipment, furnished factory-assembled and completely wired, is rated 120 kvar to serve the Westinghouse 500-kva network transformer. Note accessibility, and minimum space required. This installation was made by Alabama Power Company, in downtown Mobile.

YOU CAN BE SURE...IF IT'S

Westinghouse



This chart helps explain the interest in higher distribution voltages for commercial areas and buildings. It demonstrates the savings of a higher secondary voltage spot network radial system over a conventional 120/208-volt network.

problem: **Concentrated load areas**

solution: **265/460-volt spot network systems**

Westinghouse studies proved it—utility acceptance confirmed it—higher distribution voltages are the most practical and economical solution for heavily concentrated loads in large commercial buildings and commercial areas.

A joint study with a large eastern utility showed that a nominal 265/460-volt spot network radial system of a-c secondary network for high load densities—60,000 kva per square mile and up—offered savings up to 25% in original investment over a conventional 120/208-volt network. Another Westinghouse study of a similar system applied to a small city with a projected average load density of 120,000 kva per square mile offered similar savings over a conventional network.

This new concept of commercial area distribution is based on one or more 265/460-volt multi-transformer spot networks which not only serve large spot loads, but also supply, via multiple radial circuits, nearby loads. These radial secondaries also supply 3-phase autotransformers which step down to a nominal voltage of 120/208 volts and are connected into a secondary grid.

In addition to lower original cost, such systems offer important advantages to both utilities and power users. Higher voltages mean lower losses and thus more revenue for utilities. Users benefit from economies of direct feeding of large motors for air conditioning and modern fluorescent lighting.

Call The Man With The Facts for solutions to your network problems—or for more facts on the apparatus presented in the preceding pages. He's your nearby Westinghouse Sales Engineer—backed by 33 years of Westinghouse leadership and experience in a-c secondary networks. Or, if you prefer, write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE **SURE**...IF IT'S

Westinghouse

CP-1034

Aluminum Structures

(*Continued from page* 144)

arc from air disturbances during welding. For the 3-bay, low-voltage structure, vertical bay partitions were welded together on the ground. Horizontal front and back cross members were welded in the air. All bus supports and connections were field formed and welded.

Line-Truck Derrick Used

Sections were raised with a line-truck derrick, temporarily held in place with ropes, then fitted together, clamped and welded. Some sections were raised by a ladder truck which also was used to raise the welder to the top of the structure. The welder was held then by two sets of rope blocks so that it could be shifted horizontally and vertically during assembly. To minimize scrap material, short aluminum members were butt welded in the field and used in the structures. About 110 man-hours of welding time were required for fabrication of both structures. Most construction time was spent cutting and polishing weld areas and clamping members into place.

Plan More Installations

The 2/0 ACSR distribution conductors were attached through a compression sleeve welded to the end of the bus. Conductors were deadended at the top of the structure and looped into the compression sleeves. Similar sleeves welded to the structure frame provided for system neutral and ground connections.

DISTRIBUTION—Maintenance

Make Hot-Lines Repairs On ACSR Wires

R. H. LUCAS, District Superintendent, and **R. L. WRIGHT,** Engineer, Overhead Construction, Kansas City Power & Light Co, Kansas City, Mo.

When aluminum strands of ACSR wire are damaged by lightning, rifle shots, or cranes coming in contact with the wire, the conductor can be repaired "hot" by applying preformed armor rod over the damaged area.

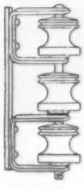
(*Continued on page* 154)

Our New, Modern Plant in the Steel Heart of Dixie

Now Ready to Serve You *Economically-Promptly-Efficiently*

with a Complete Line of POLE LINE HARDWARE

Including:



ANCHORS – GUYING GROUNDING – BOLTS – CLEVISES

—and all other items necessary for electrical distribution, transmission and telephone lines.

Top Personnel Represents Over 100 Years' Experience

Our management, engineering and technical personnel are veterans in the field and qualified by training and experience to be of real service to you in the application and use of our quality products.

Catalogs, price sheets and stock lists available on request.

AGENTS WANTED

With a modern plant in full production, and ample steel available, the company is interested in extending its sales to certain open territories for which additional agents are needed. Please advise the territory you cover and your present product lines.

DIXIE ELECTRICAL MANUFACTURING COMPANY

Birmingham 1, Ala.
P. O. Box 745 — Telephone Victor 1-5533

MR. PURCHASING AGENT:

WHAT DO YOU KNOW ABOUT RT&E?

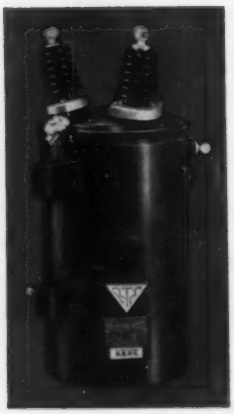
As one of the important men who supply power to America, you should know something about one of America's leading suppliers of power equipment.

While we are not the largest transformer builder, you will find us one of the most dependable. We know that you consider more than cost, that you require an extra measure of dependability and service from your suppliers. That's why you'll want to know more about RT&E.

You should know that *only* our transformers are guaranteed for *five full years* of service. And that RT&E is never too busy or standardized to build *exactly* what you want.

You should know that we maintain warehouse stocks for prompt delivery in your area, that our sales staff is trained and ready to assist you.

Next time you purchase transformers, consider RT&E. It will pay with *more* than money.



RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

Either armor-rod wrenches or jew claws (holding sticks) and jumper holders can be used.

Splicing small size ACSR can be accomplished with an automatic splice for the steel core and preformed armor rods for the aluminum strands. Full tensile strength can be attained by applying abrasive compound to the conductor and using one less rod than is in a set of rods. This gives greater strength than a full set because of the tightening action.

The splice can be made "hot", although some difficulty is encountered in cutting back the aluminum strands. A completely satisfactory tool is now available to make a clean cut of the aluminum strands on all sizes of wire.

Satisfactory tests for tensile strength have been made on 2/0, 3/0, and 4/0 ACSR. When the steel core with the automatic splice is pulled, the jaws of the splice fail at a strength greater than that required for the steel core. With the complete splice of automatic splice and armor rods, the aluminum strands break beyond the armor road at more than the ultimate strength of the wire. Tests are being made on No. 4 and No. 2 ACSR.

SUBSTATION—Construction

Steel Cap Eases Driving And Protects Ground Rods

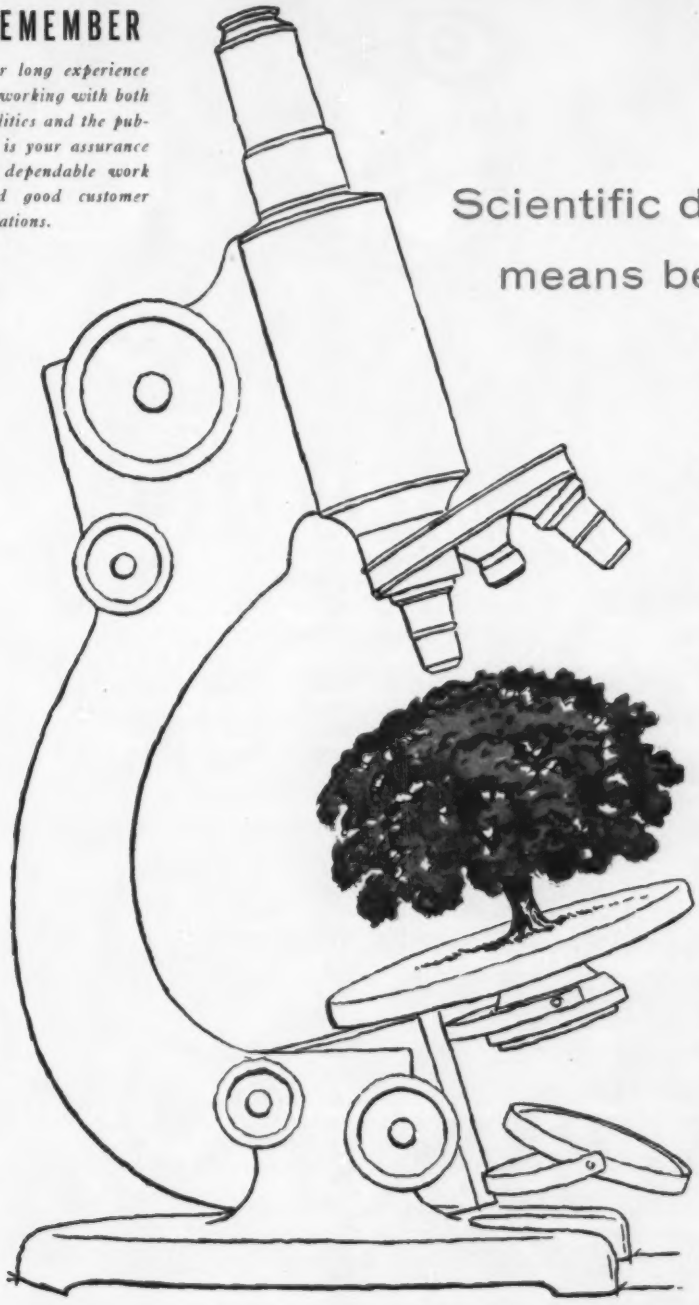
A metal driving cap makes it easier for Pacific Gas & Electric Co workmen to drive Copperweld ground rods and protects the rods against damage. The cap which slips over the rod end, affords a larger target for the sledge hammer and prevents damage to the rod by the sledge hammer handle. The cap also keeps the end of the rod from spreading when it is being driven into hard ground. Without it, the rod end could become so jagged that it would obstruct attachment of the grounding clamp, or re-use of the rod.

The driving cap is a truncated cone of hard steel. It is 8 in. long and tapers from a 3-in. dia at the top to 1½-in. dia at the bottom. A ⅞-in. hole has been drilled into the cap to a depth of 6½ in. The cap slips freely over the end of the rod where it rests firmly.

(*More How To on page* 158)

REMEMBER

Our long experience in working with both utilities and the public is your assurance of dependable work and good customer relations.



Scientific diagnosis means better tree care . . .

The basis of any curative treatment for either plants or animals is accurate diagnosis, plus the skill and experience to bring it to a successful conclusion. This means research, not guesswork as well as the best of equipment and ability.

You won't see many tree laboratories comparable to our 200-acre experimental ground and research unit at Stamford, Connecticut, where the day-to-day problems encountered by our field men are diagnosed and ideas for the protection of shade trees are tested and developed under actual growing conditions. These laboratories call for a big investment in both time and money. But to us who want to be sure of results, this painstaking research for the best possible treatment is worth it.

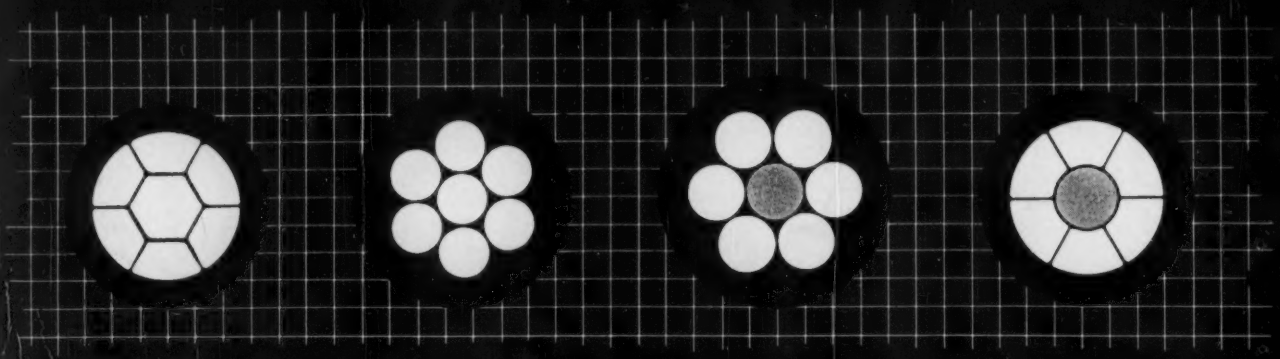
Couple this with an efficient highly skilled field force, thoroughly familiar with local conditions, and you have the well balanced Bartlett organization capable not only of rendering scientific diagnosis but of executing the prescribed treatment in efficient, economical fashion. It is the reason why more and more people are turning to the Bartlett Way—the Scientific Way. It costs no more and it is safer and more economical in the long run.

Consult your local Bartlett representative today for a study of your tree situation. You will benefit by his recommendations.

The Bartlett Way

BARTLETT TREE EXPERTS

Home Office, Research Laboratories and Experimental Grounds, Bartlett School of Tree Surgery, Stamford, Conn.
Local Offices from Maine to the Carolinas, and West to Indiana.
See your Local Telephone Directory for Local Address.



COMPRESTO* ALL ALUMINUM | ORDINARY ALL ALUMINUM | ORDINARY ACSR | COMPRESTO* ACSR

"Compresto * Cable"

"Compresto* Cable" means compressed diameter for the wire strands. Quite noticeable in the above drawings, isn't it? Yet Compresto Cable has the same aluminum area and conductivity, and the same dielectric protection as ordinary cable.

When you buy "Compresto Cable," you can select the covering you want:

1. *Neoprene covering* processed by Western Electric Company's Licensed Improved Room Temperature Method

2. *Polyethelene covering*

3. *Two Coat** rubber insulated, Neoprene jacket*

Be sure to specify Southern Electrical's Superior Quality Control products, identified by the Blue Thread.

You can get Compresto cable on our no-charge, non-returnable reels, or in standard coils or packages to your specifications. Applicable fittings are available.

* Registered U.S. Patent Office

** Trademark

Southern Electrical Corporation

CHATTANOOGA, TENNESSEE

"Compresto * Cable"

THE COMPACT COVERED CONDUCTOR THAT WEIGHS LESS...

increases safety factor in ice and wind loadings

WITHOUT ADDED COST

"Compresto*"

is adaptable to self-supporting service drop cable, or weather resistant service wire.

is the result of a special drawing technique that produces a flexible conductor of small diameter, yet maintaining the full aluminum cross-sectional area.

has greater contact surface area for standard connectors, assuring full physical and electrical properties, affording the ultimate in resistance to installation damage, abrasion, compression cutting.

eliminates the voids of an ordinary stranded conductor, reducing the weight without reducing the insulated wall thickness.

was developed and is manufactured by

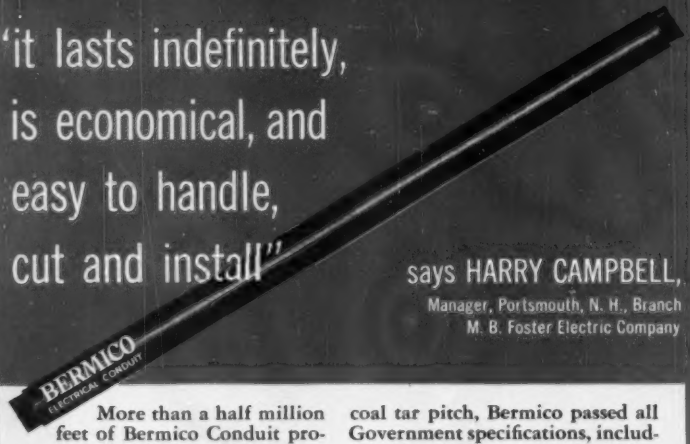
Southern Electrical Corporation

CHATTANOOGA, TENNESSEE

BERMICO® electrical conduit was installed at Portsmouth Air Force Base because...

"it lasts indefinitely, is economical, and easy to handle, cut and install"

says HARRY CAMPBELL,
Manager, Portsmouth, N. H., Branch
M. B. Foster Electric Company



More than a half million feet of Bermico Conduit protect the power, communications, runway-light, and control tower cables at the new Portsmouth Air Force Base in New Hampshire.

This Foster Electric official says he believes Bermico will serve the huge Strategic Air Command Base indefinitely.

Made to precise standards from cellulose fibre impregnated with coal tar pitch, Bermico passed all Government specifications, including heat resistance, uniformity, length-, crushing-, chemical-, and boiling-resistance, plus resistance to water absorption and flattening.

For best protection and utmost ease of installation, do what leading electrical contractors and public utilities everywhere do. Specify Bermico Conduit. Immediate shipment of all sizes and fittings.

Distributed by **WESTINGHOUSE** Electric Supply Company
Offices in principal cities

BROWN COMPANY
Berlin, New Hampshire
GENERAL SALES OFFICE: 150 CAUSEWAY STREET, BOSTON 14, MASS.

BATTERY-POWERED warning signal stands 45 in. high; folds for easy handling and storage in a line truck

Blinker Warns Traffic At 1,000-Ft Distance

A battery-powered blinker light to warn traffic approaching work areas has been developed by the testing department of Portland General Electric Co.

The amber light emits 120 flashes per min and continues to operate for well over 200 hr.

The one-piece unit uses a 6-v battery as a power supply and draws only 0.3 amp. Standing 45 in. high and painted yellow with black letters, the blinker is designed to be seen at driver's eye-level from 1,000 ft distance.

The single support leg folds up so that the unit may be carried easily and stored compactly in a line truck.

There's No Substitute for Creosoted Wood Products...

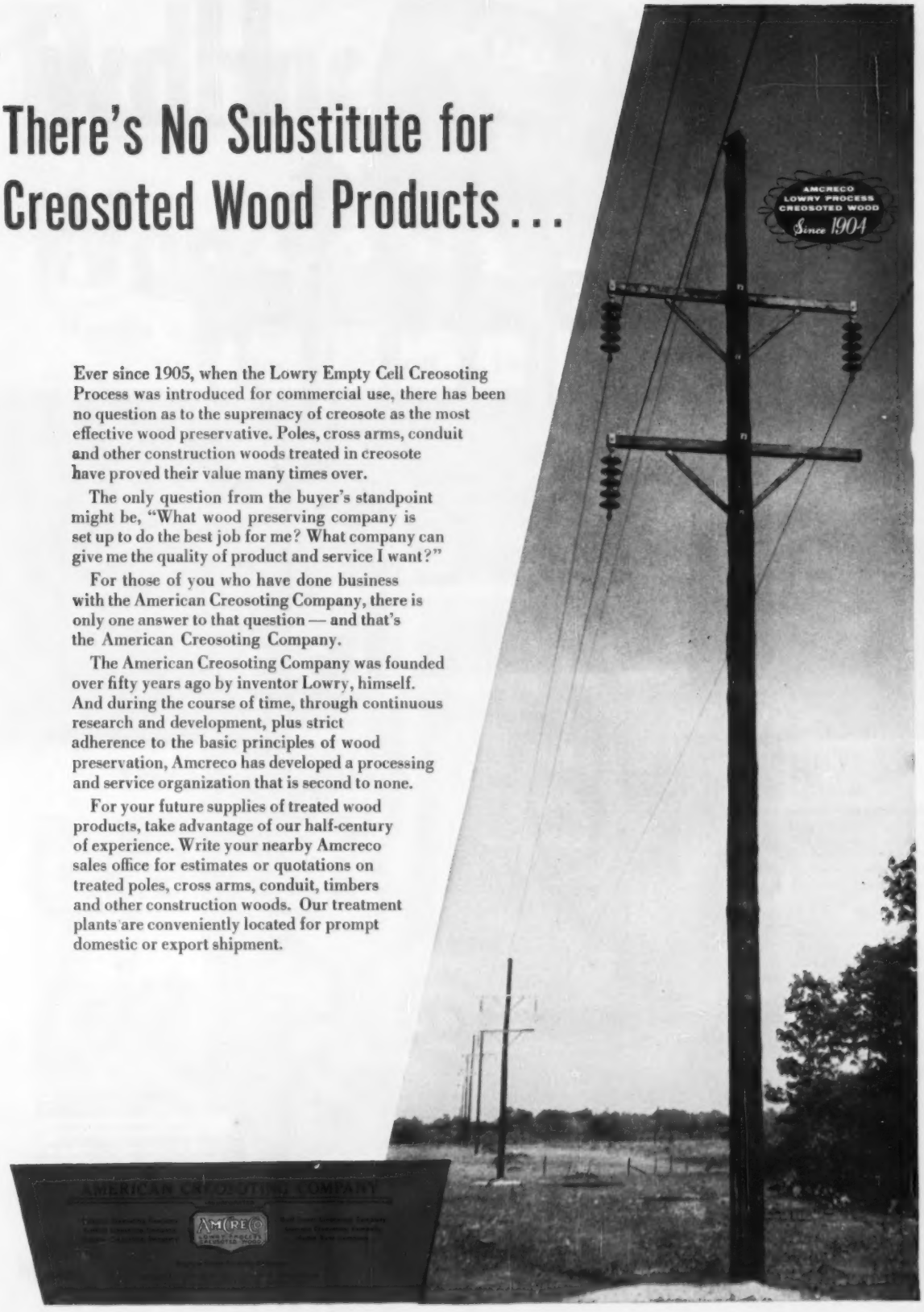
Ever since 1905, when the Lowry Empty Cell Creosoting Process was introduced for commercial use, there has been no question as to the supremacy of creosote as the most effective wood preservative. Poles, cross arms, conduit and other construction woods treated in creosote have proved their value many times over.

The only question from the buyer's standpoint might be, "What wood preserving company is set up to do the best job for me? What company can give me the quality of product and service I want?"

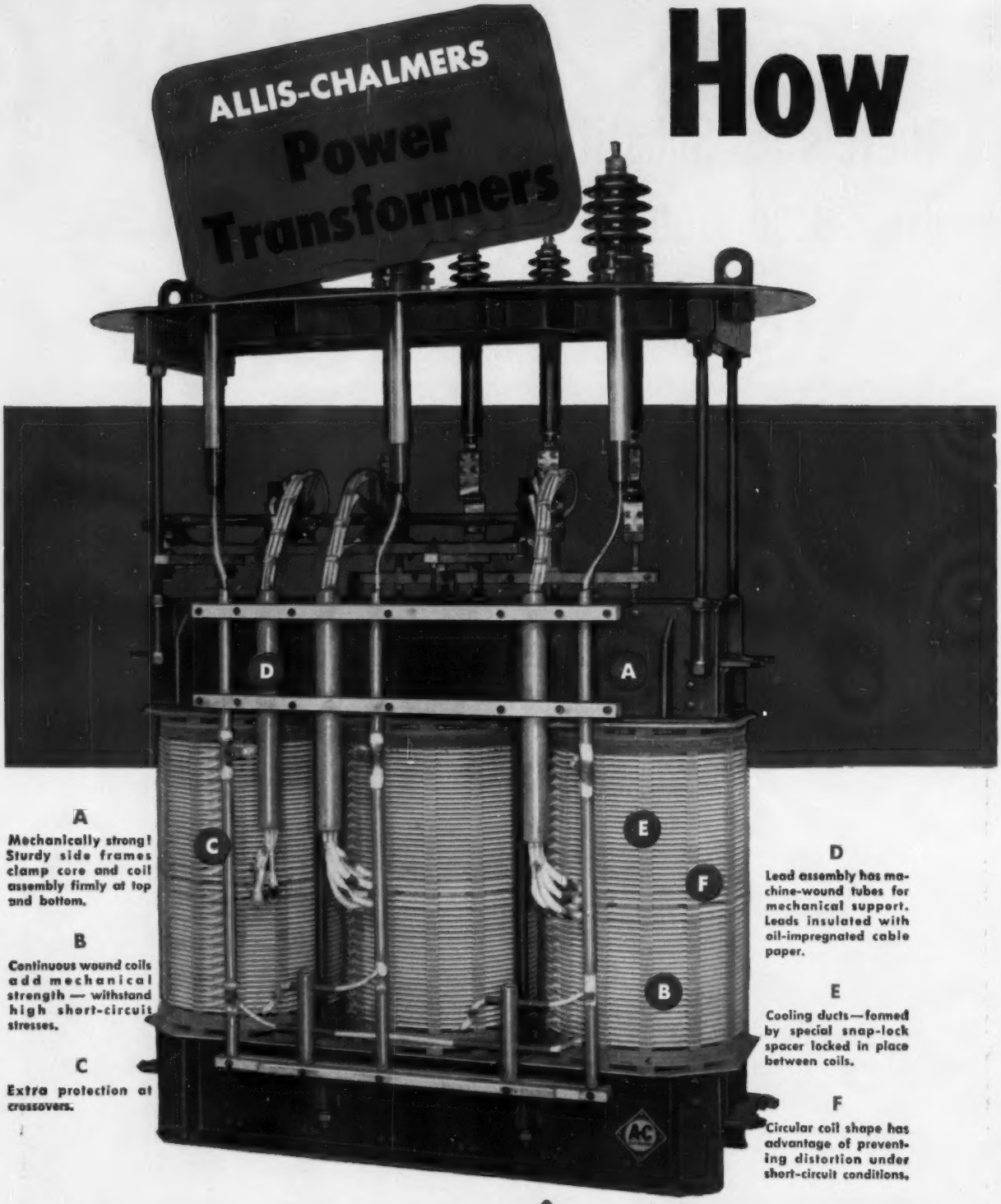
For those of you who have done business with the American Creosoting Company, there is only one answer to that question — and that's the American Creosoting Company.

The American Creosoting Company was founded over fifty years ago by inventor Lowry, himself. And during the course of time, through continuous research and development, plus strict adherence to the basic principles of wood preservation, Amcreco has developed a processing and service organization that is second to none.

For your future supplies of treated wood products, take advantage of our half-century of experience. Write your nearby Amcreco sales office for estimates or quotations on treated poles, cross arms, conduit, timbers and other construction woods. Our treatment plants are conveniently located for prompt domestic or export shipment.



How



A

Mechanically strong! Sturdy side frames clamp core and coil assembly firmly at top and bottom.

B

Continuous wound coils add mechanical strength — withstand high short-circuit stresses.

C

Extra protection at crossovers.

D

Lead assembly has machine-wound tubes for mechanical support. Leads insulated with oil-impregnated cable paper.

E

Cooling ducts—formed by special snap-lock spacer locked in place between coils.

F

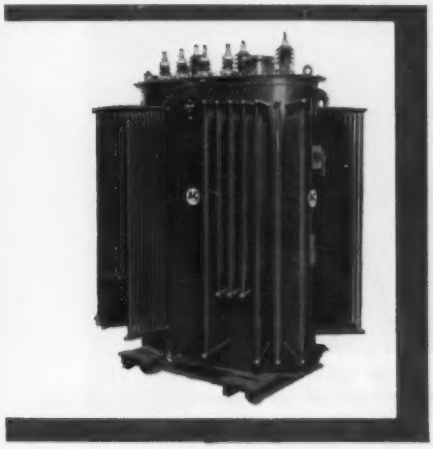
Circular coil shape has advantage of preventing distortion under short-circuit conditions.

A-C ALLIS-CHALMERS

ALLIS-

Balanced Design Works for You

Here's a combination of design features that adds up to *balanced design*... long transformer life



No single feature is all-important in transformers! But together they mean *balanced design* — all the things you want and need in a transformer.

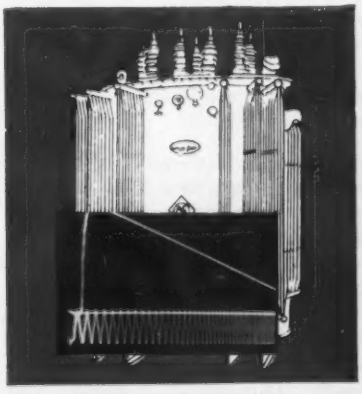
- **High impulse strength**
- **Corona-free construction**
- **Quiet operation**
- **Reduced size and weight**
- **Dependable performance**
- **High short-circuit strength**
- **Rugged mechanical construction**

In balanced design, every feature must contribute its full share to the operation. No feature can outweigh another — each must complement the other.

For example — of what value is "light weight" if it cuts performance? With balanced design you get both light weight *and* efficient performance.

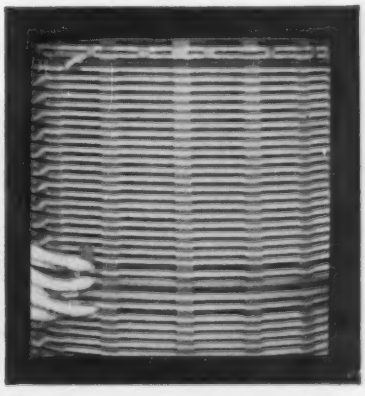
Get complete information. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Three features of balanced design



1. Corona-free design. Repeated lightning and switching voltage surges may be applied to the transformer without damage, up to full values as defined by standards.

2. Reduced size and weight. This means higher rated transformers are easier to handle — can be moved without removing radiators and bushings.



3. Proper coil design plus static shields and interleaved coils where needed provides high series capacitance, as well as more uniform voltage distribution.

CHALMERS A-4955

Electric Steam Makers Cut Paint Costs 30%

J. H. TARBELL, Industrial Engineer, Kansas City Power & Light Co, Kansas City, Mo.

Two 50-kw electric steam generators, equipped with 3-kw superheaters, are being used on the assembly line of Vendo Co, Kansas City, Mo., for hot vapor painting. The generators are completely automatic and provide heated vapor for two spray guns.

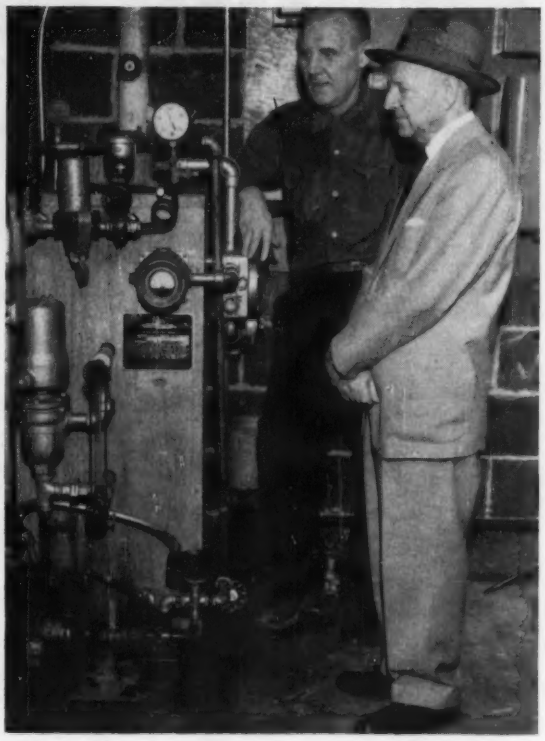
The hot vapor is used in place of air and provides a high concentration of paint with one pass, without the usual losses that occur with the air system due to spreading into the atmosphere. Vendo Co reports paint savings of about 30%.

Based on six months' experience, the annual power use of the two steam generators will be around 150,000 kwhr. Power will cost $2,000 a year.

Vendo Co investigated enamel spray painting with a view to improving their product and speeding up the operation. A high quality baking enamel is used.

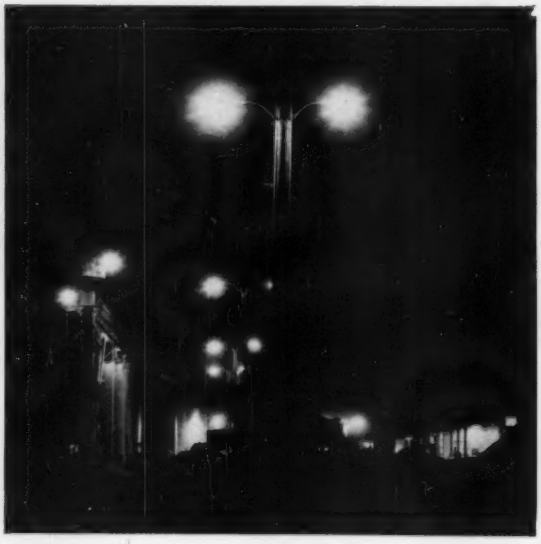
During their investigation, we suggested that electric heater units be applied to the paint tanks to increase paint temperature. This would provide a better spread for the finish coat and result in a saving.

The customer has been so pleased with results that he is considering a third unit.



TWO 50-KW electric steam generators, fitted with 3-kw superheaters, serve two sprays used for enameling products

Mercury Vapors Keep Plant Running 24 Hr/Day



ADDISON E. ALBER, Commercial Representative, Arizona Public Service Co, Tempe, Ariz.

Outdoor lighting has enabled Vegetable Oil Products Co, Inc., at Gilbert, Ariz., to go to a 24-hr-a-day, year-'round operation to speed production and cut costs.

Under the illumination of 19 400-w mercury vapor oval-shaped luminaires with H 1 lamps, men now can transport cottonseed safely at night from outdoor storage into the plant. Plant efficiency has increased and the morale of employees has jumped because they can do their work more easily and safely.

This 8.5-kw mercury vapor installation is used 10 hr a day on a year-'round basis. This amounts to 41% of the time the plant operates. During 2½ yr only one lamp has been replaced. Company officials are pleased with the installation because of long lamp life and low maintenance costs. A big factor influencing their decision to use mercury vapor was the low power cost for lumen output.

8.5 KW OF MERCURY VAPOR LIGHTING bathes this outdoor area at night, enabling vegetable oil plant to run 24 hr/day

Now... All the Way to 230 kv

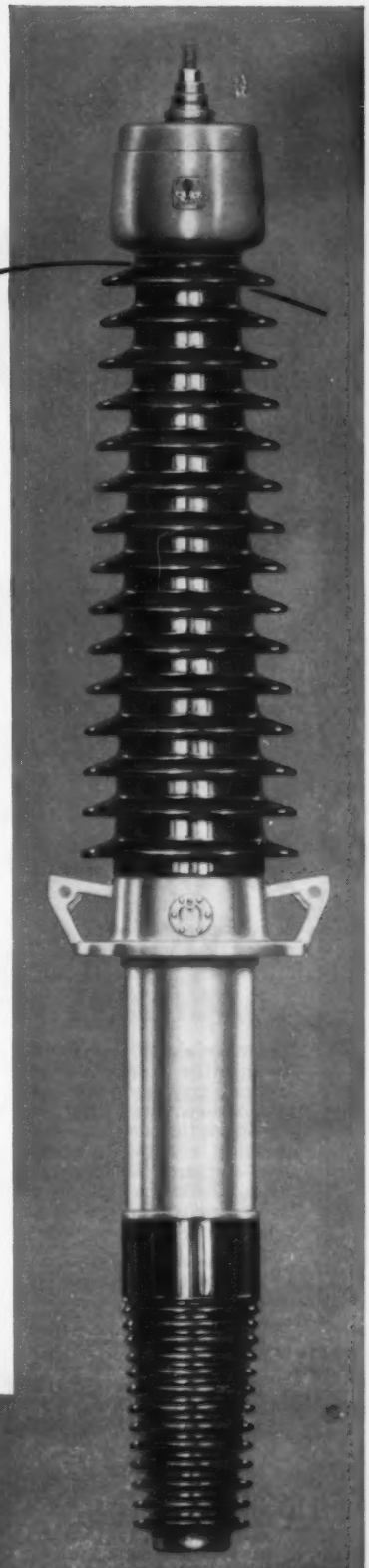
With New Small-Diameter O-B Bushings

O-B has now completed its range of small-diameter, light-weight apparatus bushings to include 230-kv operating voltage. A few quick facts about these new bushings are --

1. In this higher range (69 to 230 kv), the insulating core is surrounded with oil from end to end.
2. This core utilizes full condenser construction, comprised of multiple layers of foil and paper.
3. O-B's long-established principle of spring compression assembly, combined with improved gasketing practices, assures the vital function of permanently tight sealing.
4. In the 115 to 230-kv range, all bushings are equipped with oil level gauges and capacitance taps.
5. National Standards for these voltages have not yet been formulated, but the present O-B design is fully in line with up-to-date trends.
6. These new models extend upward in rating from the present ASA Standard series covering 23 to 69 kv. There is now an O-B bushing available for all popular operating voltages, embodying modern dimensional requirements.

One more fact -- of prime importance. For nearly 50 years, O-B has manufactured bushings that have earned the reputation for being the best of their times. This has provided priceless experience and background in embarking on design of the new O-B bushing -- a worthy member of an illustrious family.

4640-H

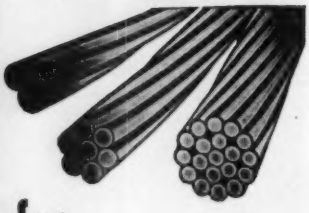


Ohio Brass

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

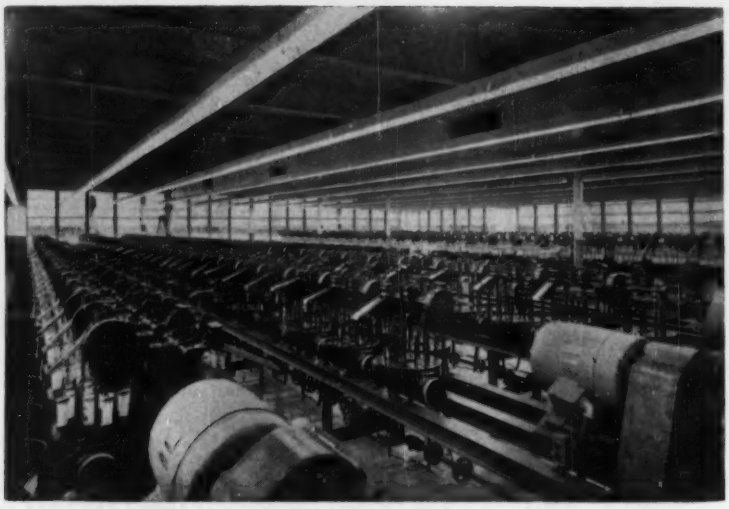
Write us at Monessen, Pa., for complete information

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

for Better Value



Certified Lighting Job Wins Top Prize

This lighting installation at New England Machine and Electric Co, Pawtucket, R. I., won top prize in the Certified Lighting Competition sponsored by the Electrical League of Rhode Island. The installation consists of 12 rows of single-lamp troffers with a total connected load of 11.8 kw. Spacing is 7 ft between rows and mounting height is 9 ft. Illumination at work level is 40 ft-c.—National Lighting Bureau, Chicago, Ill.

INDUSTRIAL NEWS NOTES

This Hole Is Cold

A worked-out limestone quarry now serves Inland Cold Storage Co as a huge frozen food freezer at Kansas City, Kan. A railroad spur in this underground warehouse brings 18 cars to loading platforms at once. Refrigeration holds 275,000 sq ft at −5F, and another 50,000 sq ft at 32F. These areas will store 2,500 carloads of frozen delicacies. Substation is above ground. Conduit carries cables through 70 ft of solid stone, GE reports. Total conduit length: 9½ miles.

•

Ore Goes In; Pipes Come Out

At the completely integrated plant of Mannesmann Steel Co. Belo Horizonte, Brazil, high-grade (65% rich) iron ore is transformed directly, and without aid of scrap iron, into steel. Two 17,500-kva electric furnaces are used to produce this steel, which then is drawn into seamless pipes and tubes. This new plant aims for a steel output this first year of 120,000 tons and 100,000 tons of pipes and tubes. But the labor force of 2,000 is to be doubled and steel output may hit 250,000 tons a year by 1960.

•

Electric Earth-Hauling Trucks

Electric earth-hauling trucks have been created for Riverside Cement Co, Riverside, Calif., for use above and below ground at a limestone quarry. Driven by 550-v traction motors, the trucks are powered either through pneumatically operated trolley poles or a self-contained reel of cable, plugged into a convenient outlet, which enables the truck to maneuver.

•

A Great Time Saver

Automation has cut coal processing time 66% for an Ohio paper company. A 990-ft conveyor carries about 300 tons a day to the company's steam plant. One operator monitors a control panel with indicating lights and a schematic diagram. He routes coal to storage, or to either or both power house bunkers 660 ft away, General Electric reports. Other operators make certain the coal flows as directed. Now it takes 8 hr instead of 24 to fuel the boilers.

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD **FLEXIBLE CAPTURED** **FLEXIBLE FREE**

JASPER BLACKBURN CORPORATION 35 MADISON STREET • ST. LOUIS • MAIN 1-2821

This is a sales manager?

That's right. Joe Warren is accustomed to having grease in his eyebrows. If getting a job out on time means Joe and *everyone* else at Royal pitching in on the production line—that's where you'll find them.

In order to give *every* customer the "Royal Treatment," we keep our operations flexible — gearing them to each individual job and *when it's wanted.*

If your needs include switchgear, any one of 5,000 standard connectors, or a special design to be engineered — call Royal. Two-to-one we'll guarantee you the fastest service anywhere . . . so try Royal *first,* and save even more time and trouble.

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

INDUSTRIAL BRIEFS

Lighting windowless room space at the plant of F. I. Carter & Sons, floral specialists at Tewksbury, Mass., is done with fluorescent units used to propagate and grow African violets and other types of house plants. The units are mounted above racks upon which growing plants are set. Illumination on these racks is about 400 ft-c, and is timeclock controlled. The cost of electricity is more than offset by savings in heat and greenhouse space. A multilayer aluminum sheeting insulation helps minimize heat losses. To gain more growing space, the owners recently installed a row of fluorescents under a greenhouse bench.

Heating diesel locomotive engine blocks when the outdoor temperature drops below 50F is done with 22.5 kw of 7½-kw immersion heaters and a ⅓-hp pump mounted on a special mobile cart. Two such units are used by the B&O Railroad in its Portsmouth, Ohio, roundhouse yards. A connection of flexible hose is made from the top of the engine block to the pump on the cart, and another hose connection is made between the electric booster heater and the bottom of the engine block. This heat maintains the treated engine water at a thermostatically controlled 160F. The pump circulates water to and from the locomotive. This heating arrangement was chosen to eliminate overnight noise disturbance in the neighborhood (that would have been caused by an idling engine) and to eliminate the burning of fuel injection tips. B. H. Weltman, Commercial Sales Representative, Ohio Power Co, Portsmouth, Ohio.

Guarding batteries against cold-weather damage is effectively done with a 5-kw heating setup at Forbes Steel, Canonsburg, Pa. The batteries which operate transformer switches, are in a building too far away to capitalize upon the central heating system. The heater is in the mouth of a 6-ft-long, 10-in.-dia tube. An electric fan sucks air into the tube, blowing it past the heater and against the batteries. Thermostatically controlled, neither heater nor fan requires attention or adjustment all winter. Clyde B. Jones, Indutrial Power Engineer, West Penn Power Co, Washington, Pa.

GOLDEN MERCURY LAMP

gives improved "caution" visibility

NEW!

SILVER-WHITE

...the most efficient mercury lamp ever made

Produces 10 to 20 per cent *more* light than clear mercury lamps of comparable wattage. Actually adds light, where previous "color improvements" subtracted from the light of ordinary clear mercury lamps. Gives broad output across the whole width of the color spectrum.

Now available in ratings of: 100-watt, 175-watt and two 400-watt types. Write for technical and application data.

Sylvania's scientists have developed a new mercury vapor lamp that gives off a golden-yellow light thanks to a combination of a new, exclusive color-emitting phosphor plus a golden colored glass bulb. This new Golden Mercury Vapor Lamp is highly effective at caution locations as a deterrent to traffic accidents.

Sylvania's Golden Mercury Lamp produces an attention-getting color of light for use at traffic intersections . . . cloverleafs . . . underpasses . . . dead-end streets . . . railway crossings . . . bridges . . . and other danger points on streets and highways. For the most effective street and highway lighting, use Sylvania Golden Mercury Lamps at caution locations and Sylvania's clear or new Silver-White Mercury Lamps for general illumination.

The Sylvania Golden Mercury Lamp is also well suited for floodlighting buildings and other areas, on special occasions, such as during a Golden Anniversary celebration, to attract greater attention.

Sylvania's Golden Mercury Lamp is now available in the popular 400 watt BT-37 bulb size. It is interchangeable with all other standard mercury vapor lamps of this same wattage. For technical and application data, write directly to:

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Salem, Mass.
In Canada:
Sylvania Electric (Canada) Ltd.
University Tower Building
Montreal, P. Q.

SYLVANIA®

...fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

With direct mail, wiring subsidies, West Penn shows . . .

How to Launch "Housepower"

Send-outs to trade allies and customers use testimonial approach; free entrance jobs offered appliance buyers

West Penn Power Co is pressing all its available promotion tools into "Housepower" service. Its promotion to upgrade residential wiring falls into three general classifications:

Pocketbooks—Residential customers who buy ranges, water heaters or dryers get a free West Penn electric service entrance job, if needed. For inside electric circuits the company charges $19.50 for range or dryer, $12.50 for water heater. Added house value, comforts and convenience of living better electrically, is stressed.

The utility emphasizes the modernization market's profit potentials to contractors, builders, and architects. "White Glove" range promotions, "Freezer Living is Leisure Living" campaign, other tie-ins have, and are, boosting dealer sales.

People—Instead of platitudes, West Penn's promotion is peopled with likeable, believable folks: **1.** "Homemaking Today," a quarterly paper mailed to 320,000 customers currently features the wife of a mineworker who built an all-electric home in his spare time. She tells why she enjoys better living electrically, gives her favorite bread recipe.

2. "Electrical Home," magazine for contractors, builders, and architects, gives illustrated case histories of how wiring men make good with "Housepower" prospects.

3. "Contact," the utility's booklet for dealers, shows how imagination and planning pay off for appliance store owners, paragraphically tells of new dealer gimmicks, products, and promotions that draw traffic.

4. "Electrified Farming" pictures and describes happy farm wife laundering electrically, and a farmer pleased with his new hay-drying system.

The Payoff—The public's interest in "How's Your Housepower?" contest was whetted by West Penn's April teaser ads. Now it's cultivated by radio, direct mail, window displays, ad mats used by dealers, and word of mouth. The company tells its trade allies that the big winners will be those who promote "Housepower" and other national campaigns.

West Penn's all-out push is understandable. It has been identified with "Housepower" in one way or another since its inception. It was West Penn's Vice President Harry Restofski who as chairman of Edison Electric Institute's Wiring Committee, headed up the preliminary work which led to "Housepower's" development.

Reverse-Cycle Pays

Small heat pumps in motel add good load, help get gas out of the kitchen

DONALD W. RUNQUIST, Commercial and Residential Sales Manager, St. Joseph Light & Power Co, St. Joseph, Mo.

Does time spent on heating and cooling problems of the small businessman pay? Judging from a typical Savannah, Mo., installation of small heat pumps, the answer would seem to be yes, both from the standpoint of customer satisfaction and utility load. And the new equipment has a tendency to haul along on its coat tails the installation of other electrical devices.

St. Joseph Light & Power Co recently aided a Savannah motel owner with selection of all-weather, reverse-cycle air conditioning units for ten cottages ranging in size from 160 to 200 sq. ft. Demand has increased from 11 kw to 39 kw in the summer and 56 kw in winter.

Each heat pump has a 3-kw heating element that is turned on automatically when temperature drops to 42F and the compressor shuts off. One drawback was that unit efficiency tended to drop at temperatures under 50F and frost formed on the outside coil.

In an adjoining cafe, 44.7 kw of electric cooking equipment has replaced flame-type equipment. It includes a heavy-duty fry kettle and two commercial ranges. The customer has also taken bids for air-to-air heat pumps to heat and cool the cafe.

Recipes Draw Prospects

In advance of its rural cooking schools Sacramento Municipal Utility District asks homemakers to submit their favorite receipts for casseroles, cookies and cakes. Winning entries are announced at the school, thus helping to build attendance and expose more people to the electric appliance sales story. Winning recipes baked at the show are given as door prizes to the audience.

(*More S & S on page* 170)

Get life-of-turbine guarantee for turbine oil just as Blackwell, Oklahoma light plant does—

Use NONPAREIL Turbine Oil

Five NONPAREIL Turbine Oil guarantee certificates hang on the wall of the light plant at Blackwell, Oklahoma, one for each turbine in the plant. They show that the turbine oil is guaranteed, for the life of the turbines, not to exceed a neutralization number of 0.15 mg. KOH/gm.

One of the guarantees is for the oil installed in a turbine in 1937. Up to then, the Blackwell Light Plant management had experienced trouble with turbine oil. Oil had to be changed and "rested". Separate batches of oil as well as cleaning oils had to be kept on hand. In June of 1937 the turbine was changed over to NONPAREIL Turbine Oil. As other turbines were added in 1939, 1942 and 1951, their initial fills were NONPAREIL.

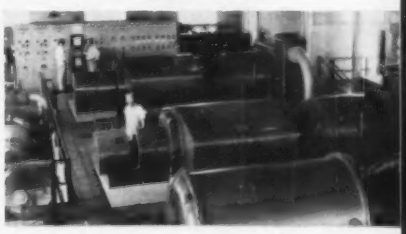
The five guarantee certificates on the plant wall are reminders to management that their decision to use NONPAREIL Turbine Oil was a good one. Since NONPAREIL went into the first turbine in 1937, the oil has *never* been treated in any way. Oil lines and system remain clean. Neutralization number of the oil in all five turbines has remained far below 0.15 mg. KOH/gm. In most cases it has ranged near 0.03 mg. KOH/gm.

Look into the possibility of using NONPAREIL Turbine Oil in your turbines. Call for additional information from your Standard Oil industrial lubrication specialist. There is one near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

J. V. Kincheloe (right) Blackwell light plant superintendent and Standard Oil lubrication specialist John Thornquist view NONPAREIL Turbine Oil guarantee certificates. John Thornquist is well qualified to assist industrial customers with lubrication problems just as he has done at the Blackwell plant. He has been doing this sort of work at Standard for 19 years. In addition, John is an engineer with a degree from the University of Minnesota and a graduate of the Standard Oil Sales Engineering School.

Turbine Oil Record Blackwell Municipal Light Plant

Type Turbine	Size—KW	Date NONPAREIL Installed	Capacity gal.	Range of Neut. No. (mg. KOH/gm.)
Westinghouse	2,500	June, 1937	173	.03 to .06
Westinghouse	4,000	April, 1939	150	.04 to .05
Westinghouse	1,500	January, 1942	75	.02 to .05
Westinghouse	4,000	May, 1951	325	.03
Westinghouse	4,000	May, 1951	325	.03



Turbine room of Blackwell, Oklahoma municipal light plant. NONPAREIL Turbine Oil is used in all five Westinghouse turbines.

STANDARD

STANDARD OIL COMPANY (Indiana)

Which Twin Is the Phony?

Visitors to new San Antonio, Texas subdivision were urged to look for adequate wiring and lighting when buying a home with this display set up by the city's Public Service Board. "Which twin is the phony?," asks the display. "On the surface homes may look the same, but what's inside? Make sure yours is wired for modern electric living." Utility sales personnel stood by to tell the lighting-wiring story and to answer questions.

New Tunes for LBE

• One night music festival for Central Maine Power Co employees, complete with orchestra and chorus, led off with national anthem and woundup with LBE theme.

• Western Massachusetts Electric Co, Pittsfield, has signed a 13-week contract with local radio station to play LBE theme song twice daily, six days a week at choice times.

• In a single month (Feb. 8-March 9) at least 1,400 Live Better . . . Electrically ads were run by utilities and their allies in local newspapers. Estimated cost: $600,000.

• Sun Beam and RCA-Whirlpool plugged LBE on their nationally televised Martha Raye show recently.

S & S SHORTS

Wisconsin Farm Film Offered

Farmers can learn how to reduce labor through use of electric equipment in a new 16 mm. sound-color film produced by University of Wisconsin College of Agriculture and the Wisconsin Utilities Association. Titled, "The Wisconsin Electric Research Farm," the film is available on a loan basis from the Bureau of Audio-Visual Instruction, 1312 W. Johnson St, Madison, Wis., or may be purchased from the association, 135 W. Wells St., Milwaukee 3, Wis.

Crackdown Ups Pump House Heating

Missouri health board crackdown on unsanitary dairy farm pump pits has boosted use of above-ground, electrically heated pump houses. The Missouri board operates under U. S. Public Health Service Code applicable in all states.

Quick Recovery Up

High-wattage water heater pushed by utilities serving 30% of domestic meters

Sale of quick recovery water heaters now is accepted by utilities serving 13.7 million or 30% of the nation's domestic customers. These are Electrical World's figures developed from a report just released by General Electric Company.

Leading champions of quick recovery, according to the report, are the electric cooperatives. Those plugging the high-wattage unit's sale serve about three million meters or 75% of the co-op total. Added to this are 37 other utilities and power agencies who serve 10.7 million domestic customers. They include:

Alabama Power Co
Baltimore Gas & Electric Co
California Electric Power Co
California-Oregon Power Co
Central Power & Light Co
Cleveland Electric Illuminating Co
Duke Power Co

El Paso Electric Co
Florida Power Corp
Florida Power & Light Co
Georgia Power Co
Georgia Power & Light Co
Gulf States Utilities Co
Los Angeles Dept. of Water & Pwr.
Lower Colorado River Authority
Memphis Light, Gas & Water Div.

Mississippi Power & Light Co
Montana Power Co
Niagara-Mohawk Power Corp
Oklahoma Gas & Electric Co
Omaha Public Power District
Pacific Gas & Electric Co
Pacific Power & Light Co

Portland General Electric Co
Public Service Co of Indiana
Public Service Co of Oklahoma
Sacramento MUD
San Diego Gas & Electric Co
Sierra Pacific Power Co
Snohomish County PUD

Southern California Edison Co
South Carolina Electric & Gas Co
Southern Colorado Power Co
Southwestern Public Service Co
Tampa Electric Co
Tennessee Valley Authority (all distributors)
Washington Water Power Co

DEMONSTRATION of slack in conductors is shown when Anaconda preassembled reverse-lay aerial cable is untwisted. Opened cables enable linemen to make connections easily—without cutting conductors or messenger.

Built-in slack helps linemen make quick taps —with Anaconda reverse-lay aerial cable

When transformers, cutouts or laterals make numerous connections necessary — Anaconda reverse-lay aerial cable permits easy separation of conductors whenever the need arises.

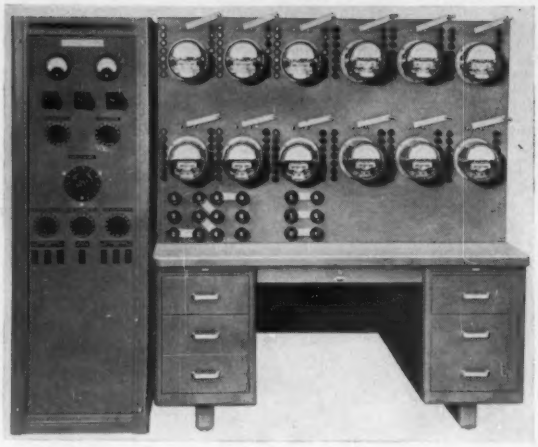
Lay of the conductors is reversed approximately every five feet — within easy reach of linemen. Unwound between reversal points, conductors have sufficient slack to eliminate the need for cutting conductor or messenger when making connections.

"Hot" taps can be made on 5kv nonshielded cables, eliminating power shutdowns. Opened cable allows use of wire guards and rubber blankets between the conductors for greater safety.

Ask the Man from Anaconda for full details. And write for new Aerial Cable Catalog. Anaconda Wire & Cable Company, 25 Broadway, N. Y. 4, N. Y.

SEE THE MAN FROM **ANACONDA®**

FOR **AERIAL CABLE**



Test Cabinet

This control cabinet and rack tests single-phase and polyphase bottom terminal (A) and socket (S) type thermal demand meters. Capacity is 200 amp, 120/240 v. Equipment includes phasing and voltage control regulators, 3 phasing transformers, and 3 phase course potential control.

The 6-ft rack table has 12 single-lever operated quick contactors. Rack may be connected for single meter or multiple meter testing, and for connecting elements of meters separately or in series.

States Co, 19 New Park Ave, Hartford, Conn.

Hydraulic Aerial Booms

Designed for street light maintenance work, this aerial lift has hydraulically operated boom that is said to provide a work space at heights from low-level luminaires to 36 ft.

Insulated crow's nest and outer boom have a dielectric strength rating of 20 kv. They rotate on the truck-mounted turret which has a turning arc of 400 deg. Other applications are terminating underground cables on riser poles, changing deadends on end pins, repairing overhead conductors in mid-span, and removing limbs from wires in mid-span.

Called the Lamp King, the lift's upper and lower booms are designed to provide maneuverability.

Maxwell Equipment Co, Inc, Ford St, Milford, Conn.

One feature of this aerial platform is a double-acting hydraulic cylinder for each beam with a linkage system. Supporting mast can be rotated continuously in either direction. The unit, designated series AB-1-41, is now in full production.

Outer beam has operating arc of 270 deg and inner beam 115 deg. Called the Sky-Master, it has ground-to-basket height of about 41 ft, safe load capacity of 350 lb, and safety factor of 5. Bulletin 412 available on request.

McCabe-Powers Auto Body Co, St. Louis 15, Mo.

(*More New Equipment on page* 174)

"No failures from weathering in over 65 million feet of NEOPRENE-covered wire and service drop cable"

SAYS PUBLIC SERVICE ELECTRIC AND GAS COMPANY

It's a fact . . . you can't beat neoprene covering for dependable service on wire and cable. The experience of the Public Service Electric and Gas Company of Newark, N. J., is a good case in point.

Since 1945, Public Service has used over 65 million feet of neoprene-covered overhead conductors . . . and today is installing over 18 million feet of neoprene-covered line wire and service drop cable yearly.

Despite exposure to all types of atmospheric conditions —including heavy industrial and chemical fumes in many of the areas served—neoprene covering is giving the long service expected. Public Service reports: "*No failures to date due to aging or weathering.*"

Like Public Service, you can count on extra-long service from neoprene-covered wire and cable. In addition to its resistance to weathering and chemical attack, neoprene withstands oil, grease, and ozone. Your savings in maintenance and replacement costs start from the day neoprene goes on the job.

Be sure of the best covering for your conductors . . . the best investment for long-term performance. Ask for covering of Du Pont neoprene.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

MAIL THIS COUPON TODAY!

FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip this coupon to get on the mailing list.

E. I. du Pont de Nemours & Co. (Inc.), Elastomers Division EW-6
Wilmington 98, Delaware

Name _____ *Position* _____

Firm _____

Address _____

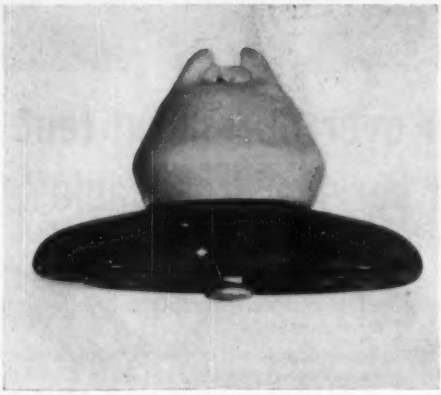
City _____ *State* _____

Liquid-Metal Pump

This hermetically-sealed mechanical liquid-metal pump is designed to circulate liquid sodium and sodium potassium alloy. It is applicable in nuclear power plants and for other uses requiring high temperature heat transfer mediums. The pump is available in capacities up to 5,000 gpm for fluid temperatures as high as 1,600 F.

Pumped fluid heat reportedly has little affect on motor winding temperatures so winding insulation considerations do not limit pumped fluid temperatures. Pumps have no external shaft seals. Suction and discharge nozzles are designed to be welded into the pipeline. Radial bearings have a mounting system to provide for thermal expansion.

Westinghouse Electric Corp, Atomic Equipment Dept, Box 2278, Pittsburgh 30, Pa.



Suspension Insulator

This ball-and-socket suspension insulator is said to have 36,000 lb M&E and 100 in.-lb impact strength. Its diameter is 16% less and weight 35% lighter than EEI-NEMA class 52-7 clevis type—the standard 36,000-lb insulator.

Pictured unit weighs 15.5 lb and porcelain is 10-in. diam. Unit spacing is 5¾ in. Leakage distance per in. of spacing is 1.91 in. Other electrical characteristics are about the same as class 52-5 insulators (25,000 lb M&E, 60 in.-lb strength, and 15-lb weight).

The unit, designated "UHS," is designed for anchor or large angle towers, special crossings, and deadending bundled conductors.

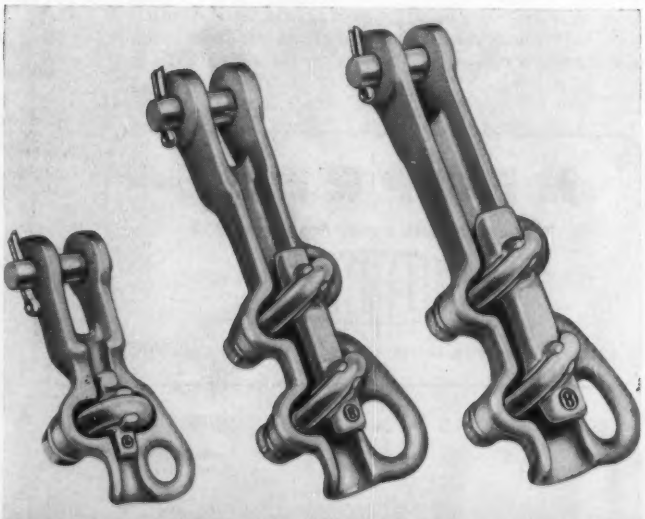
General Electric Co, Insulator Dept, Baltimore, Md.

Clamp Keeper

Manufacturer's clamps for deadending distribution lines now feature keeper piece attached permanently to U-bolts. This cuts number of loose parts and is said to aid hot line jobs and maintenance work. The ½-in U-bolts permit tightening torques of 600 in. lb. Keeper piece "ears" reportedly grip U-bolts and hold them in flanges to provide alignment in installation.

Ohio Brass Co, Mansfield, Ohio.

(More New Equipment on page 178)



Permanently safe from corrosion
Hubbard Copperweld Hardware

When your grounding application calls for the corrosion-proof performance of Copper combined with the strength of Steel, specify Hubbard Copperweld! Ground Rods, Sectional Ground Rods, Drive Head Ground Rods, Ground Wire Clamps, Staples and Nails are formed by the unique Copperweld molten-welding process which welds a uniform, thick sheath of Copper to an alloy Steel Core. From then on, Copperweld performs as if it were a single solid metal, installs easily, gives permanent service under the most adverse conditions of moisture and corrosion.

No matter what your specific hardware requirements call for, there is a Hubbard item especially designed for the job. Hubbard's four thousand items of pole line hardware are the most complete line in the industry. Several basic materials are available to allow you to match specific metal characteristics to individual conditions.

Call your Hubbard Distributor—he's an expert —for helpful answers on how to get the most out of your Pole Line Hardware dollar.

HUBBARD AND COMPANY

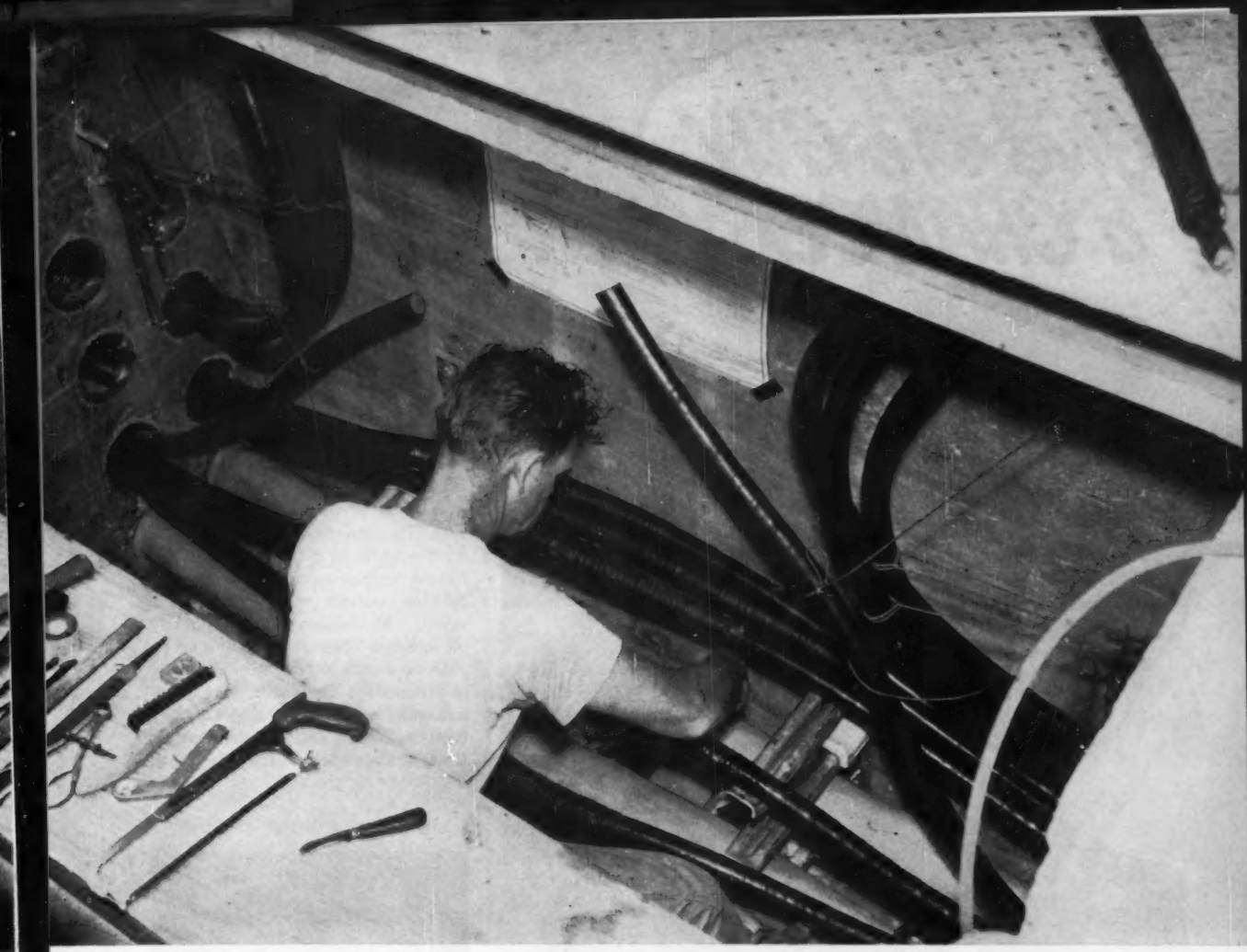
Pittsburgh 1, Pa.
Chicago 50, Ill.
Oakland 8, Calif.
Dallas (Plano), Texas

Polyethylene insulation, vinyl jacketing

...for all cable in this chemical plant's 13.8 KV system

Cable for this installation supplied by:
Anaconda Wire & Cable Co.,
New York 4, N. Y.
Rome Cable Corp.,
Rome, N. Y.

Pulling and cutting cable. Combination of tough vinyl jacket and lightweight polyethylene insulation makes for easier handling by installation crews.



Splicing 13.8 KV cable insulated with BAKELITE Brand Polyethylene and jacketed with BAKELITE Brand Vinyl Plastic.

CRITICAL chemical processes carried out at the Carbide and Carbon Chemicals Company plant at Torrance, California, need a dependable, uninterrupted flow of power at 13,800 volts.

To meet these demands, all the distribution cable installed there is insulated 100 per cent with BAKELITE Brand Polyethylene, jacketed with BAKELITE Brand Vinyl Plastic.

Most of the cable is underground. The hazards of moisture, electrolysis, chemical spillage, and heat are always possible. This insulation and jacketing combination withstands them all.

BAKELITE Polyethylene insulation has practically zero moisture absorption, and is inert to most chemicals. Its superior electrical properties include a low dielectric constant and high insulation resistance. BAKELITE Vinyl Plastic jacketing is extremely tough—withstands abrasion, is unaffected by most chemicals and oils, has excellent resistance to aging. Both materials are easy to strip and splice, and have good flexibility.

Latest developments in the use of BAKELITE Polyethylene and Vinyl Plastics for wire and cable are covered in *Kabelitems*, published periodically. To have your name placed on the mailing list, write Dept. QU-53.

BAKELITE BRAND PLASTICS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

CHANCE 8-WAY ANCHORS

It's not surprising that in every field test the Chance 8-Way Expanding Anchor holds more than its rated load because its design just makes common sense. *Eight* blades expand to form a pyramid shaped square —there is no wasted space between blades. The load is distributed *evenly*—all around the hole. It just seems logical that it should hold more, and it does. That's why it's on so many company standards. Your Chance Anchor Distributor can supply you from stock. *Specify Chance for Service!*

"ANCHORING" is the most complete guide to anchoring and guying ever developed. Shows how to choose the right anchor for every job—and how to install it *right*.

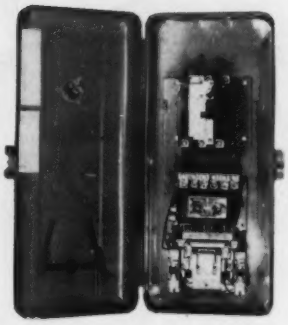
A·B·CHANCE CO·

CENTRALIA, MISSOURI

San Francisco, California

Pittsburgh, Pennsylvania

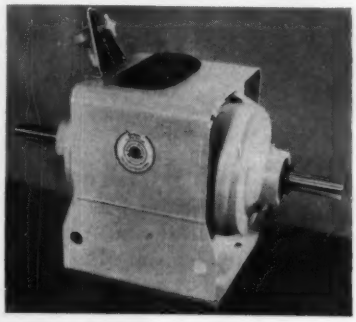
CA59-1



'E' Frame Breaker

A smaller "E" frame circuit breaker has been made standard on all of manufacturer's combination starters with breakers rated 250-v, 100 amp max. This new design and 600-v form have provisions for same type of handle mechanism now used on combination starters with a disconnect switch. Mechanism mounts directly on breaker. Starter handle can be padlocked only in "off" position. Now in production, the breaker has an interrupting capacity of 7,500 amp.

General Electric Co, General Purpose Control Dept, Schenectady 5, N. Y.



Fluid Drives

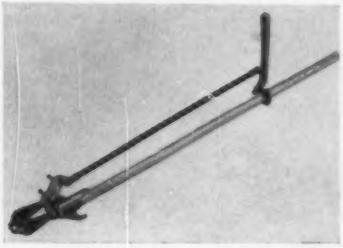
Added to line is a Class 2 series of adjustable speed fluid drives for 1 through 25-hp applications. They are described as permitting drive motor to come up to speed under virtual no-load conditions. This allows, manufacturer says, design simplification in selection of motors; practicability for across-the-line starting, even on inertia loads; and declutching of load from motor at any cycle time.

The drives are designed to protect drive motors and driven machinery from shock loads, torsional vibration and excessive torque. They are available in four sizes (designated 55, 76,

92 and 107) for use at operating speeds of 1,200 and 1,800 rpm (plus 3,600 rpm for 55 and 76).

Manufacturer says drives can be used for direct drive with separately mounted constant speed electric motor, V-belt or chain. Output connection may be direct, belt or chain.

American Blower Corp, Detroit, 32, Mich.

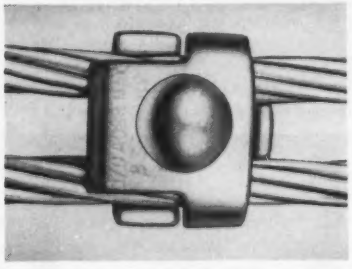


Splicer

This redesigned splicing tool is for manufacturer's sleeve splices on energized lines. Lever-operated, it crimps sleeve to form a bond when conductors are spliced. Pressure of jaws automatically decreases, the maker says, when sleeve is sufficiently compressed.

Poles are treated with plastic coating and tested to 75-kv per ft before shipment, manufacturer reports. They are available in 4 and 6-ft lengths.

A. B. Chance Co, Centralia, Mo.

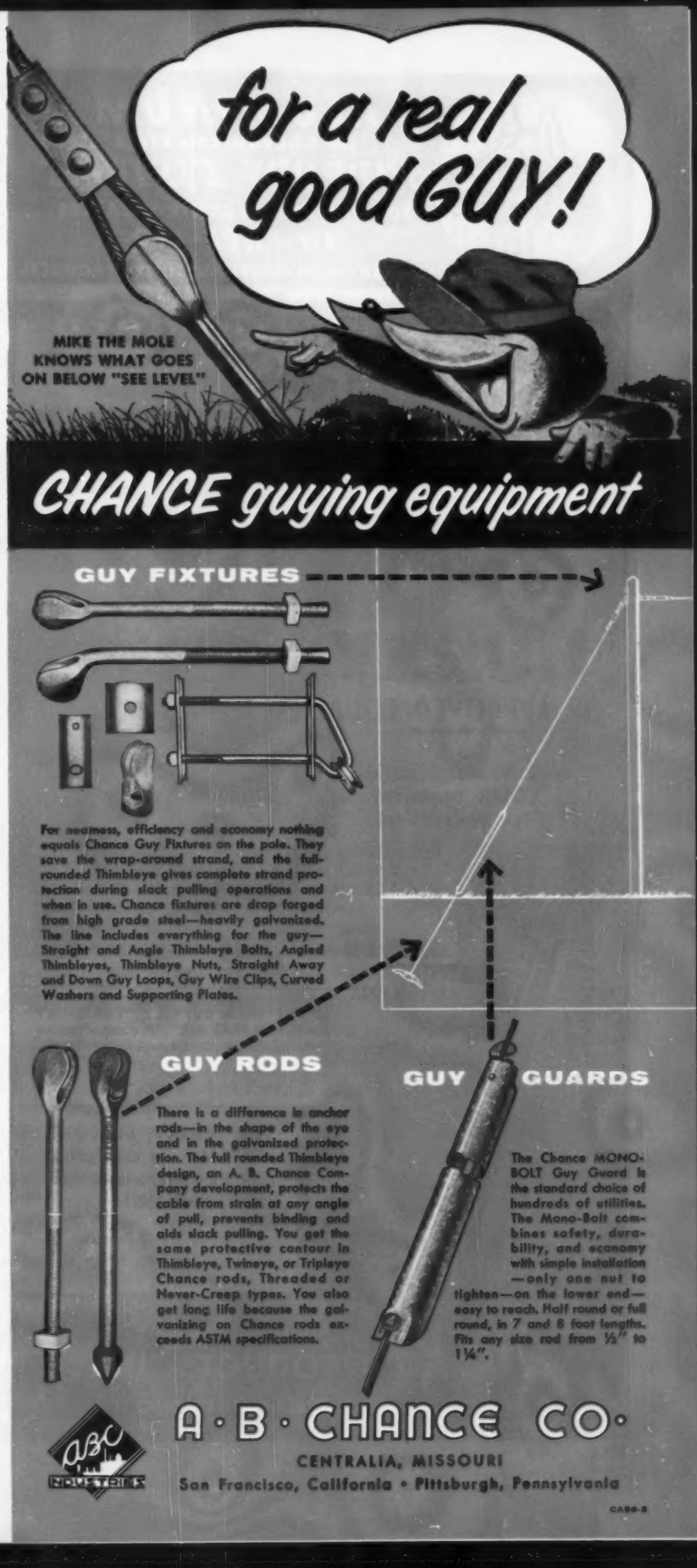


Clamp

This parallel groove clamp makes aluminum-to-copper, copper-to-aluminum, and copper-to-copper connections. The aluminum-bodied design is protected with a cadmium-coating which is said to ward off oxidation and corrosion. It also eliminates possibility of putting connector on wrong for a bi-metal connection.

The clamp features interlocking contacts for both main line and tap.

(*Continued on page* 180)


for a real good GUY!
MIKE THE MOLE KNOWS WHAT GOES ON BELOW "SEE LEVEL"
CHANCE guying equipment
GUY FIXTURES
For neatness, efficiency and economy nothing equals Chance Guy Fixtures on the pole. They save the wrap-around strand, and the full-rounded Thimbleye gives complete strand protection during slack pulling operations and when in use. Chance fixtures are drop forged from high grade steel—heavily galvanized. The line includes everything for the guy—Straight and Angle Thimbleye Bolts, Angled Thimbleyes, Thimbleye Nuts, Straight Away and Down Guy Loops, Guy Wire Clips, Curved Washers and Supporting Plates.
GUY RODS
There is a difference in anchor rods—in the shape of the eye and in the galvanized protection. The full rounded Thimbleye design, an A. B. Chance Company development, protects the cable from strain at any angle of pull, prevents binding and aids slack pulling. You get the same protective contour in Thimbleye, Twineye, or Tripleye Chance rods, Threaded or Never-Creep types. You also get long life because the galvanizing on Chance rods exceeds ASTM specifications.
GUY GUARDS
The Chance MONO-BOLT Guy Guard is the standard choice of hundreds of utilities. The Mono-Bolt combines safety, durability, and economy with simple installation—only one nut to tighten—on the lower end—easy to reach. Half round or full round, in 7 and 8 foot lengths. Fits any size rod from ½" to 1¼".
A·B·CHANCE CO·
CENTRALIA, MISSOURI
San Francisco, California • Pittsburgh, Pennsylvania
CAB6-8

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

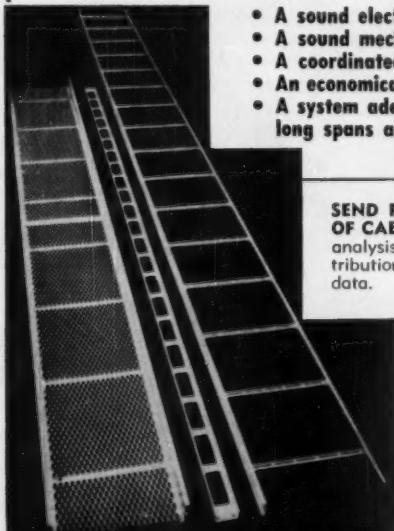
Engineers—Please remember—these famous words:—

"There is hardly anything in this world that some man cannot make a little cheaper—and a little worse. . ."

Specify:
HUSKY
OR APPROVED EQUAL

and be certain that YOUR approval gives your client:

- A sound electrical system.
- A sound mechanical system.
- A coordinated system with unit responsibility.
- An economical job—the lowest "Installed Cost."
- A system adequate for indoor or outdoors, for long spans and ideal for future expansion.



SEND FOR YOUR COPY OF "THE STORY OF CABLE IN FREE AIR". A comprehensive analysis of the modern trend in power distribution with photographs and economic data.

THE HUSKY SUPPORT SYSTEM—the only cable support system approved and recommended by all major cable manufacturers.

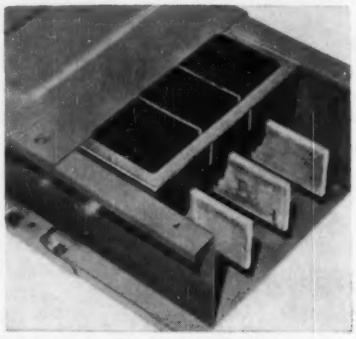
AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO

Clamp

(*Continued from page* 179)

All strands of the conductor are thus supported and contacted. This Series 200 clamp is available in three sizes. It is also made without cadmium coating for aluminum-to-aluminum.
A. B. Chance Co, Centralia, Mo.



Bus-Duct Insulator

Design of insulator for this plug-in bus-duct reportedly withstands fault currents of 50,000 rms amperes. The bus duct was developed for high capacity commercial and industrial electrical distribution.

Tests were conducted by an independent laboratory on this type loaded with 3-phase fault currents from 46,000 and 57,000 amp. Individual arc fault tests simulated extreme conditions of heat shock.
Federal Pacific Electric Co, Eastern Switchgear Division, Scranton, Pa.

Light Control

This light control unit uses a light sensitive cadmium sulfide cell, replacing prior model's photo-tube. The c/s cell makes possible a stable low-

(*Continued on page* 182)

Each of these Penta-treated poles is ready to serve 30 years or longer

Checking new shipment of Penta-treated poles destined for Ohio Edison Company lines, one of many utilities using such poles.

Today, more and more utilities specify Penta-treated poles. The reasons for this are clear. Poles treated with Penta are protected from decay and insect attack for 30 years or longer. And they stay clean . . . will not "burn" hands or stain clothing. The public appreciates this feature and so do linemen. Handling is easier, installation faster.

Penta protection can be measured. Penta is not a by-product. It is a uniform chemical compound, developed by Monsanto especially for wood preservation. Because of this uniformity, you can take increment borings from Penta-treated poles, have them chemically analyzed and determine the *exact* amount of Penta in the poles.

SPECIFY PENTA for wood poles, crossarms, transformer platforms, braces, control boxes, planking. Treating plants all over the country are ready to apply Penta for you. Write us for this list and for free "Poles and Crossarms" booklet. Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Dept. PI-11, St. Louis 1, Mo.

MONSANTO

WHERE CREATIVE CHEMISTRY WORKS WONDERS FOR YOU

M-S-A® Shockgard

NEW—IMPROVED

Offers these important protective features:

- Meets all E. E. I. Specifications
- Dielectrically tested at 15,000 volts
- Withstands 40 foot lb. impact
- Weighs less than 15 ounces

There's no question that this M-S-A Shockgard passes every protective test in the books—but that's only half the story. Equally important is the M-S-A *hat-by-hat* testing program that makes sure every Shockgard sold *maintains* the high safety factor specifications. This testing program is not a matter of "batch" approval, or control sampling. *Each and every* Shockgard is examined and tested. And we can uphold this rigid standard because our complete manufacturing facilities are under one roof —from material preparation to packaging and shipping.

The new Shockgard is available in yellow or grey. There is no metal in any part of the hat. The snap-in suspension is easily adjusted, quickly replaced, and eliminates pressure points. *Write for details.*

Leather or leatherette sweatband; winter liners and chin straps available

MSA
SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES CO.
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N. S. • Representatives in
Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

Light Control

(*Continued from page* 180)

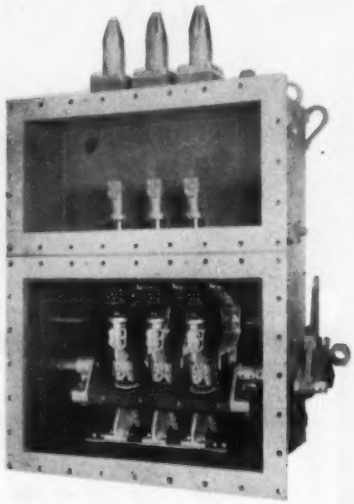
impedance circuit, manufacturer reports, and minimum sensitivity to atmospheric conditions.

Sensitivity range is 1-6 ft-c (turn-on, 1.5 ft-c unless otherwise specified; turn-off, 0.5 ft-c from turn-on point). Unit must be exposed to continuous light for 2 min before functioning, manufacturer says, and Plexiglass cover integrates light from all directions, eliminating orientation. Attachments include a 3-prong plug fitting into an adapter.

Micro Balancing, Inc, Garden City Park, N. Y.

Transformer Switch

This 15-kv, 400-amp subway style switch is constructed to bolt or weld to any network transformer. It connects, disconnects or grounds feeder cables. The switches are designated type "RA," and are designed for filling with oil or with Askarel.

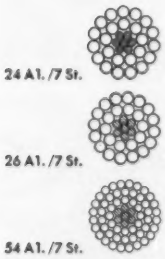


The transformer switch comes with or without electrical interlocks. All contacts are silver plated and with different lengths of contacts (bottom), the three phases A, B and C can be grounded separately in sequence, manufacturer reports. Rocker arm link strap is made of resin impregnated laminated wood.

G&W Electric Specialty Co, 7780 Dante Ave, Chicago 19, Ill.

(*More New Equipment on page* 185)

ACSR Bird Cages Are "Kaputt"



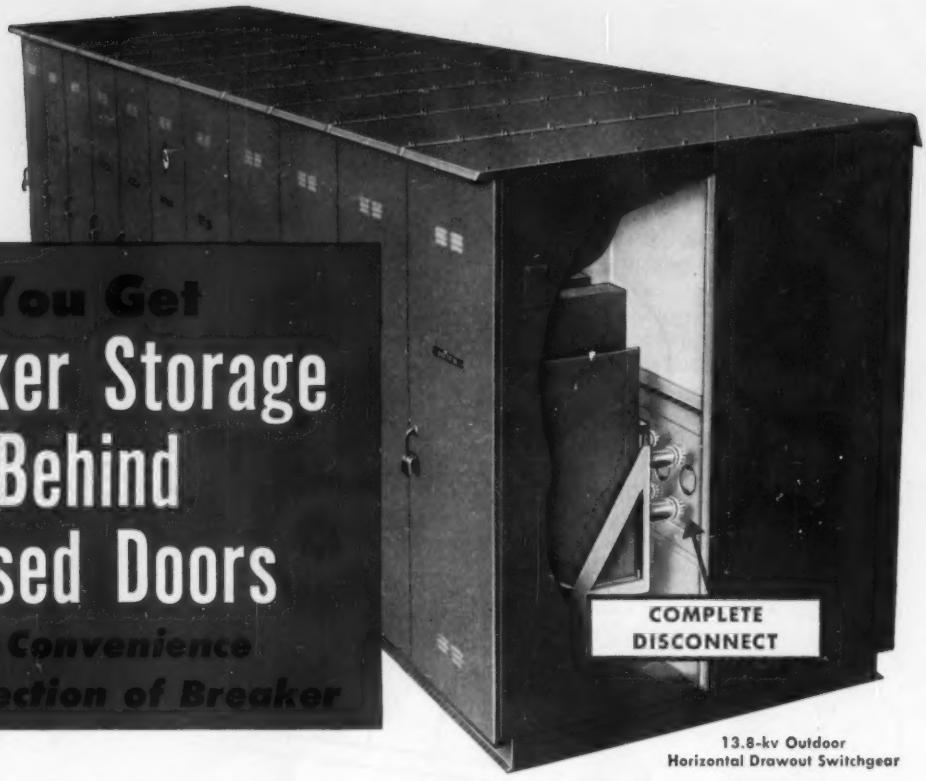
Yes! "Bird-Caging" can be eliminated with Midland ACSR . . . for although it takes a bit longer to produce on our slower moving Planetary Stranders, we are able to produce a highly superior product with them! All the strands in Midland ACSR are laid into the cable evenly and are tension perfect. This includes our full range of ACSR sizes from AWG#6 to largest circular mill.

MIDLAND WIRE CORPORATION

MIDLAND WIRE CORPORATION

DIVISION OF ESSEX WIRE CORPORATION

Factories at Birmingham, Alabama; Anaheim, California; Tiffin, Ohio



13.8-kv Outdoor
Horizontal Drawout Switchgear

You Get Breaker Storage Behind Closed Doors

for Convenience ...Protection of Breaker

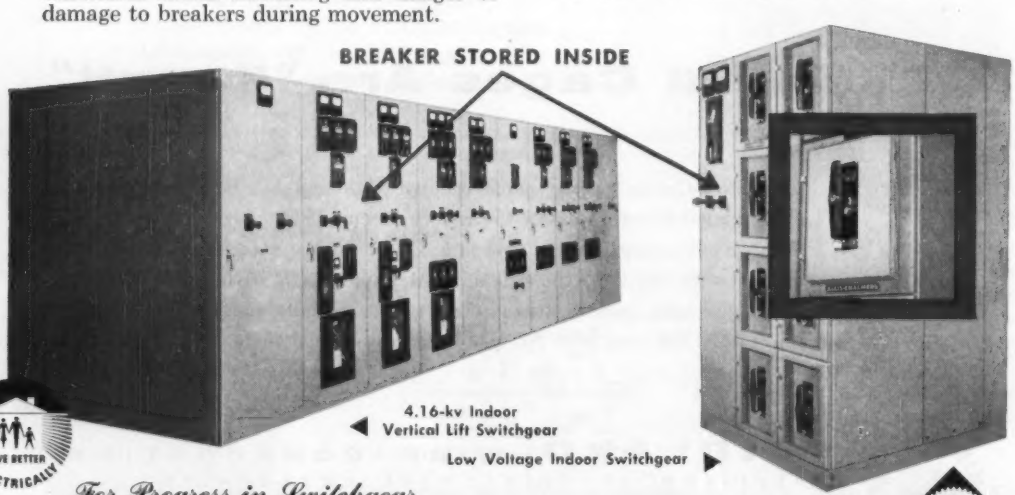
All types of Allis-Chalmers switchgear have provision for storage of fully disconnected breaker inside cubicle, with the door closed.

No special storage space is required for breakers not in use — simply disconnect the breaker and store it in its own cubicle.

This popular feature of A-C switchgear eliminates much handling and danger of damage to breakers during movement.

When breaker is in disconnected position, it is safely removed from primary and secondary contacts. Here it remains firmly fastened to withdrawal mechanism and can't move into unit accidentally.

This is only one of many features of Allis-Chalmers switchgear. For the complete story, call your nearby A-C office, or write concerning your problem to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.



4.16-kv Indoor
Vertical Lift Switchgear

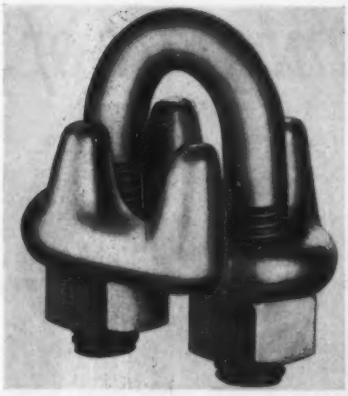
Low Voltage Indoor Switchgear

LIVE BETTER ELECTRICALLY

For Progress in Switchgear

ALLIS-CHALMERS

A-5083



Wire Rope Clips

These assemblies feature positive gripping, a base channel holding wire rope without individual strand damage, and U-bolts protected by hot-dip galvanizing after threading. Clips are made to secure wire ropes of ⅛ to 1¼-in. diam.

American Chain & Cable Co, Inc., 929 Connecticut Ave, Bridgeport 2, Conn.

MORE NEW PRODUCTS

Minnesota Mining & Mfg Co, Dept D6-54, St. Paul, Minn., offers two lines of **insulation tape,** both impregnated with a thermo-setting epoxy resin. Tapes are designed to meet Class B requirements for varied insulation uses, have dielectric strength over 1,000 v per mil and volume resistivity of 10^{13} ohms at 96% RH.

Aluminum Co of America, 1501 Alcoa Bldg, Pittsburgh 19, Pa., has a non-skid abrasive aluminum **tread plate** designed for catwalks, truck and trailer floors, bus steps and aisles. Booklet available on request.

General Electric Co, Schenectady 5, N. Y., has **outdoor thermostat control** that automatically adjusts indoor thermostat for sudden temperature changes.

Barber-Colman Co, 1400 Rock St, Rockford, Ill., offers **tachometer generators** in three frame sizes with max rated outputs of 7,000 rpm or 100 v, whichever occurs first. Capability is up to 40 v per 1,000 rpm within 0.5% linearity over operating range. Catalog F-4344-3 on generators and dc motors available.

Just one application of "Telvar" controlled weeds around this fence. Note the type of vegetation involved in untreated area in the foreground.

Spray just once with Du Pont TELVAR®

WEED KILLERS

When you use "Telvar" weed killers, vegetation is killed through the roots, and regrowth is prevented because the chemical remains in the soil . . . provides residual action all season long. And low dosages (1 to 1½ lbs. per 1,000 sq. ft.) make it cost little for the results you obtain. Such low rates also mean less handling, less use of storage facilities.

"Telvar" weed killers come as wettable powders, are non-corrosive, non-flammable, non-volatile, low in toxicity to humans and livestock.

Include "Telvar" weed killers in your weed-control program this year. Prove to yourself how these products of Du Pont research can help cut your maintenance cost to new low levels.

Where brush is a problem, Du Pont Ammate® X weed and brush killer is the product you need. It kills more kinds of brush with unusual safety. With ordinary precautions, "Ammate" X may be used close to such crops as cotton, tomatoes, soybeans and peanuts.

• • •

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. Write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, 80 Richmond Street West, Toronto, Canada.

DU PONT
REG. U. S. PAT. OFF.

On all chemicals, follow label instructions and warnings carefully.

WEED and BRUSH KILLERS

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

An important part of

Light

with LIGHT for LIVING

PORTABLE LAMP SELLING KIT—An idea package to help sell more portable lamps by more effective merchandising and salesmanship. Contains "how-to" books on merchandising, displaying, advertising portable lamps—plus light conditioning recipes. Kit: 50¢

It's Electrifying

LIVE BETTER ELECTRICALLY

for Living!

Leads the way to increased residential load by brightening and bettering the homes in your community

Your giant LIVE BETTER ELECTRICALLY program is designed to make the homes in your area more useful, more attractive and more saleable. Proper lighting is certainly one of the features that brings these benefits to your customers. And Light for Living, the industry wide plan to improve residential lighting, helps you put better lighting at the finger tips of home owners everywhere.

It's the practical, complete program endorsed by manufacturers and distributors of lamps and fixtures, bulb and tube manufacturers, electrical contractors, real estate groups and mortgage bankers. For complete information on Light for Living and the helpful promotional material that is available (see below), contact your local General Electric Lamp Sales Representative.

Progress Is Our Most Important Product

GENERAL ELECTRIC

FIXTURE SALES KIT—A guide to increase fixture sales. Kit contains tips on displaying, merchandising, advertising; 38-page Lighting Fixture Guide; and a soft-cover version of a best selling book on home decorating written by experts. Normally $6.75. Kit: $1.00

BUILDERS PACKAGE—Shows how to put visible sales features of Light for Living into homes; cost-comparisons of light conditioning vs. other selling features. Seven interesting books on lighting, home decorating, even a book of "selling sentences". Package: $1.00

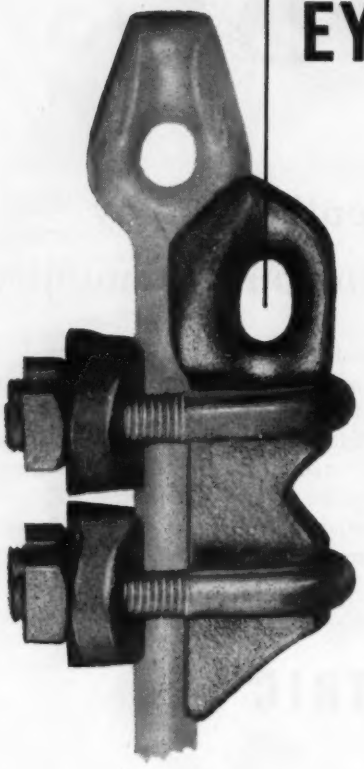
OUTDOOR LIGHTING PACKAGE—Everything needed to make Light for Living—Outdoors the key to bigger residential loads. Plan Book shows utilities how to coordinate the program—and become the nerve center of the local lighting industry. Package: 80¢

the Nation!

malleable iron

HIGH CORROSION RESISTANT

AUXILIARY EYE



Secured directly to a thimble or oval eye anchor rod it provides an additional eye for another guy, either permanent or temporary, or serves as a temporary attaching point for blocks or come along.

Where the strength of the existing anchor rod and capacity of anchor are adequate, using the MIF Auxiliary Eye eliminates costly digging and saves valuable time and material.

MIF Auxiliary Eyes come in various sizes to accommodate bolt and rod diameters of from 5/8" to 1".

For further information Write for Bulletin PH 3.

MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION

Branford, Connecticut

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich.

CATALOGS—BULLETINS

• **BUILDING DIRECTORY:** Directory lists organizations in building industry which are sources of information and gives details on individual groups conducting research, development or data assembly or analysis. Free to members; $2 a year to non-members. Building Research Institute, 2101 Constitution Ave, Washington 25, D.C.

• **AMERICAN STANDARDS:** Spring, 1956, American Standards price list and index issue has been published. Included are fields of building and construction, electrical, chemical and mechanical engineering, and safety. American Standards Assn, Inc, 70 E. 45 St, New York 17, N.Y.

• **OSCILLOGRAPH:** Fully automatic 22-channel oscillograph for monitoring power system transmission circuits is described in Bulletin No. GED-3049, 16 pages. Design and operation data and specifications are given. General Electric Co, Schenectady 5, N. Y.

• **METERING TRANSMISSION:** The Orthoflow system for transmission of metering data from one location to another is described in Bulletin No. 700. The 16-page brochure contains diagrams, dimensional drawings, and capacity charts for each type of application of the Orthoflow system which utilizes a two-wire circuit. Simplex Valve & Meter Co, Lancaster, Pa.

• **HYDROMATIC VALVE:** Publication 5813 describes design features and operation of hydromatic valve used to control de-mineralizers, Zeolite softeners, dealkalizers and pressure filters by operators of ion exchange equipment. Cochrane Corp, 17th St below Allegheny, Philadelphia 32, Pa.

• **ALUMINUM BRONZE:** An 8-page report on development of nickel-aluminum bronze and its applications. International Nickel Co, Inc, Reader Service Section, 67 Wall St, New York 5, N. Y.

• **PRECISION RELAYS:** Features, description, operation and specifications of two series of high and low limit action precision relays are described in 4-page Bulletin MRM 240. Manning, Maxwell & Moore, Inc, Industrial Controls Division, Stratford, Conn.

• **SNAP-ACTION SWITCHES:** A digest of application ideas for snap-action switches is given in this 16-page booklet. Case histories, submitted by plant operating men, describe a variety of industrial and commercial applications. Micro Switch, "Micro Tips Digest," Freeport, Ill.

• **50-KVAR UNIT AUTO-SWITCH:** Design features of 50-kvar capacitors' auto-switch equipment made by manufacturer are given in 4-page Bulletin GEA-6485. General Electric Co, Schenectady 5, N. Y.

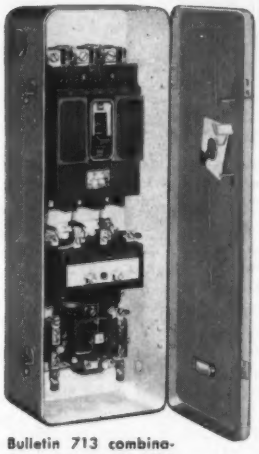
• **TRANSOMETER:** Six-page bulletin 301 describes applications, features, ranges, and specifications of transometer which comprises a positive displacement type flow meter and a pneumatic signal transmitter. Askania Regulator Co, 240 E. Ontario St, Chicago 11, Ill.

• **CLUTCHES:** Catalog 103-C, 8 pages, describes line of clutches for over-running, backstopping and indexing with dimension and engineering data. Formsprag Co, 23601 Hoover Road, Van Dyke, Mich.

Hacksaws on shipping floor of Peerless Machine Company, Racine, Wis., all equipped with Allen-Bradley Bulletin 712 combination starters

ALLEN-BRADLEY COMBINATION STARTERS

Save Time · Neater Installations · Add Safety



Bulletin 713 combination starter with I-T-E instantaneous circuit breaker.

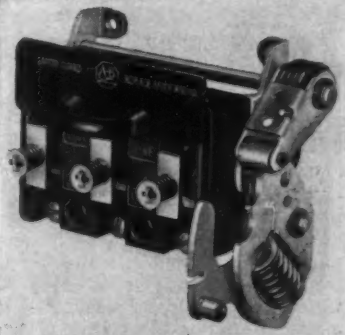
Machinery builders like the trim appearance of Allen-Bradley combination starters on their machines. Their customers like them, too, because they provide added safety to workmen. You can't open the cabinet unless the disconnect lever is in the "OFF" position.

The new Bulletin 712 combination starters have disconnects with contacts **plainly visible** when the switch is in the "OPEN" position — another safety feature. Bulletin 713 starters use an I-T-E circuit breaker as their disconnect.

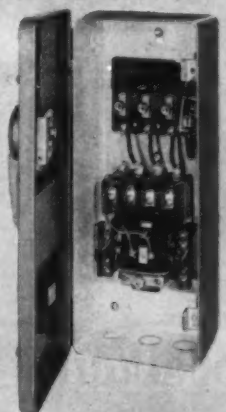
Two thermal relays give continuously reliable overload protection and prevent costly motor burnouts. After tripping they are reset from the front of the cabinet.

For complete information, send for the Allen-Bradley Handy Catalog.

MANUAL DISCONNECT with visible contacts



Disconnect unit (with contacts visible in the "OFF" position) used in Allen-Bradley Bulletin 712 combination starters.

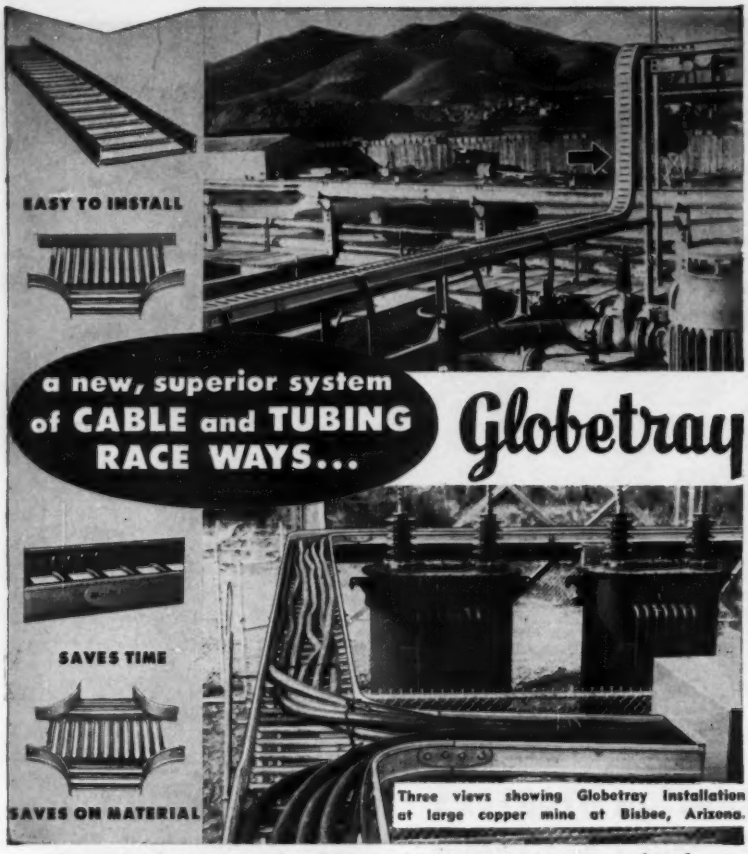


Bulletin 712 combination starter showing disconnect and magnetic starter in one enclosure.

Allen-Bradley Co., 1327 S. First St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

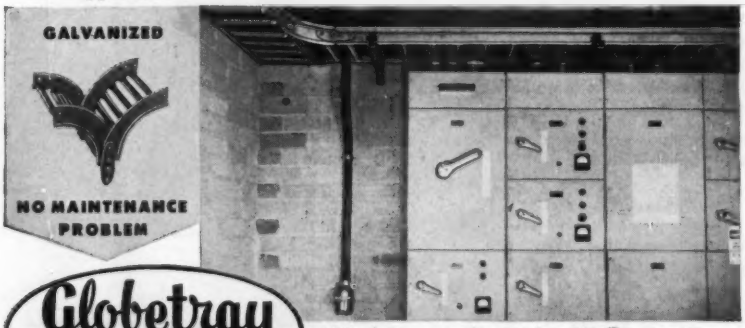
ALLEN-BRADLEY
QUALITY

BULLETIN 712-713 COMBINATION STARTERS



A completely engineered system of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The universal splice plate joins all parts through the side channels only. All curved fittings are joined at the end of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

Comes in 6", 12", 18" and 24" widths, in standard 12' lengths to further speed up installation time. Cable way can be cut to length at any point – insides and bottom always smooth – all sections punched for easy installation – perfect fit at all times. Neat, clean and uniform in appearance.



Write for new complete catalog. Distributors in all principal cities. Contact the Grip-Strut distributor under "Conduits" in the classifed telephone directory.

Manufacturers Since 1914 **The GLOBE Company**

4030 S. PRINCETON AVE. • CHICAGO 9, ILL.

BOOKS

Received Since April 30, 1956

Engineering Applications of Vector Analysis. By Leonard L. Barrett. Published by National Press, 435 Alms St, Palo Alto, Calif. 114 pages, illustrated. Price $3.50.

Uberspannungen in Energieversorgungsnetzen. By Herbert Baatz. Published by Springer-Verlag, Reichpietschufer 20, West Berlin 35, Germany. 295 pages, illustrated. Price DM 34.50.

Weather Analysis and Forecasting—Vol. I: Motion and Motion Systems—Second Edition. By Sverre Petterssen. Published by McGraw-Hill Book Co, 330 W. 42nd St, New York 36, N. Y. 428 pages, illustrated. Price $8.50.

Handbook Preferred Circuits, Navy Aeronautical Electronic Equipment. Prepared by National Bureau of Standards, Dept. of Commerce, for Bureau of Aeronautics, Navy Dept. Published by Government Printing Office, Washington 25, D. C. 172 pages, illustrated. Price $1.75.

How Europe Views Atomic Power

Possibilities of Action in the Field of Nuclear Energy. Published by The Organization for European Economic Co-operation, 2, Rue Andre-Pascal, Paris, France. 70 pages, illustrated. Price $1.00.

This booklet is a round-up of European aims and accomplishments in the nuclear energy field. Emphasis is on aims and methods of cooperation, rather than on accomplishments. Written in layman's language, it has chapters on the demand for nuclear energy, production, aims, cooperation, and joint undertakings. Appendices contain information on U. S. bilateral agreements and description of technical problems and accomplishments.

Electricity on the Farm

Rural Electrification—Fifth Revised Edition. By J. P. Schaenzer. Published by Bruce Publishing Co., Milwaukee. 378 pages, illustrated. Price $3.75.

This book is especially written for high school vocational agriculture teachers, but it has a place in the library of every utility serving rural areas. Written for the layman, it contains much basic material that is of interest to the ordinary residential customer even though it deals heavily with farm applications of electricity.

This new edition includes considerable useful information on appliances such as television, dishwashers, and automatic clother washers. But the biggest contribution is in the area of farm equipment, including motors, dairy refrigeration, electric hot beds, and many others. There is information on the economics of such equipment for farm production.

The book is interestingly written, well illustrated, and may be used as promotional tool for utilities.

(*More Books on page* 208)

EXCEEDS CLASS III SPECIFICATIONS

Wet or dry, pick your flashover test, NEW Kimble *Tempered* Glass insulators show flashover resistance exceeding A.I.E.E. requirements. In puncture tests, too, *Tempered* Glass insulators are outstanding. It has proved impossible to puncture them in air, even under the most severe maximum voltage impulses applied. Four years of field testing on more than 500 miles of line have produced no puncture failure. Even lightning surges have failed to damage them.

If it's on the pin, it's in service

In the event of shattering due to severe mechanical shock, insulator disintegrates into many small, non-sharp fragments. Trouble shooters can locate broken insulators—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. It's a Kimble production method that gives Kimble insulators a hard-compression surface layer that makes them strong enough to meet the severe test required. This great strength saves installation time because it's never necessary to loosen for line up with the conductor—they can always take another quarter-turn.

Why not see how *tempered* glass can cut your line maintenance costs. Write for folder. Address: Kimble Insulator Division, Owens-Illinois, Dept. EW-6, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

4 Cables to Link Michigan Peninsulas

Consumers Power Co will lay four underwater cables across the four-mile wide Straits of Mackinac this month. The 46-kv link will connect Michigan's upper peninsula to the lower part of the state for the first time.

The cables, a product of Okonite Co, were shipped on four railroad flat cars. A fifth car carried a 100-ton capacity lifting beam for transferring the cable reels to a barge. The paper-insulated, lead-sheathed, armored power cables are about 2.1 in. in diameter and have a total weight of 750,000 lb.

Examining a cable sample above are, left to right, Dr. R. J. Wiseman, vice president and chief engineer, V. L. Garrison, Paterson plant manager, G. N. Everest, factory sales manager, and C. M. Kirkland, vice president of sales, all of Okonite.

Pump-Storage Interest Up Allis Chalmers Reports

Utilities and consulting engineers are showing increased interest in pump-turbine storage as a method of leveling daily and weekly load curves, according to Allis-Chalmers Manufacturing Co. The firm recently announced that inquiries show the number of projects under active consideration is greater than in 1955.

A-C said some pump-storage jobs aim for eventual capacities of about 1-million kva at a single site. Maximum unit rating will probably be limited as much by transportation facilities as any other factor. Project planning is underway, the announcement stated, by utilities without existing hydro generating facilities. Locations not suited for conventional hydraulic turbines can be adapted for reversible pump-turbines, according to Allis-Chalmers engineers.

Dravo to Supply H-P Pipe to Detroit Ed, Consumers

Dravo Corp of Pittsburgh will fabricate high-pressure piping systems for two Michigan utilities:

1. A main steam header of chrome-alloy steel, to be 22-in. dia and 4.25 in. wall thickness, is one of eight systems in the high-pressure section for Detroit Edison Co's new 321,500-kw cross-compound turbine-generator. This unit is designed for steam conditions, 2,400 psi at 1,050 F with reheat to 1,000 F, supplied by a 2,000,000 lb per hr steam generator.

2. Main, hot and cold reheat, and boiler feed piping (largest chrome-alloy pipe 18 in. diam) for a new 156,-250-kw turbine-generator for Consumers Power Co's Weadock Station at Essexville, Mich. Normal operating throttle steam conditions are: 2,000 psi at 1,050 F with reheat to 1,000 F.

Aluminum Secondary Racks Cut Corrosion Problems

Damages by sulphuric gases in the Indiana Harbor area appear to have been overcome according to engineers of Northern Indiana Public Service Co. A one-year test of aluminum alloy secondary racks used on overhead distribution revealed no corrosive effects.

The utility's engineers plan to use aluminum racks for replacements. They are now using some aluminum conductor thimbles and exploring the use of aluminum guy wire protectors.

Ontario Picks Phillips Bid For St. Lawrence Cable

About $250,000 worth of 230-kv cable will be supplied Ontario's powerhouse of the St. Lawrence Seaway hydro project by Phillips Electrical Co, Ltd. The firm is Canadian affiliate of British Insulated Callender's Cables, Ltd, of London.

Four circuits are planned with total length of 20,000 ft. An oil-filled, 3.53-in. diam cable with a hollow copper 960 Mcm core will be used. It will have a special fire-proofed, anti-corrosion protective covering.

The cables will terminate at a structure about 600 ft from the powerhouse. From there power is to be carried by four single-circuit overhead transmission lines to transformers 2.25 miles north of the powerhouse. First cables will be installed in 1958; completion date is late in 1959.

(*More M & M on page* 194)

Trenching. This 'Jeep'*-propelled trencher unit digs up to 800 feet of clean-cut trench per hour, to speed the installation of cable, conduit and service lines. With the accelerating trend to underground lines, the 'Jeep'-trencher unit becomes increasingly important in electrical industry service.

Versatile 'Jeep' vehicles do more jobs... GO "anywhere—any time"!

Maintenance. The 'Jeep' Truck is the *only* time-tested and performance-proved 4-wheel drive truck in its weight class. Its 4-wheel drive traction takes equipment and crews to trouble spots in storms or other emergencies.

Transportation. The Universal 'Jeep' travels the highway at top legal speeds in conventional 2-wheel drive. A flick of a lever shifts it into 4-wheel drive to go through mud, sand, up steep grades, where ordinary vehicles can't go.

Versatile "go-anywhere" 'Jeep' vehicles help assure uninterrupted, 'round-the-clock electrical service.

They have the all-wheel traction to go almost anywhere, to serve on job after job 24 hours a day. These rugged vehicles reach out-of-the-way line installations or patrol the right-of-way, in good weather or bad—wherever line service or maintenance is needed.

With power take-off, performance-proved 'Jeep' vehicles operate many types of special equipment from winches to sprayers for weed control. They take power right to the job—on the road or off.

Rugged 'Jeep' vehicles are functionally designed to withstand the toughest use...spread their cost over hundreds of different jobs from stringing high lines to installing meters. And their low upkeep, long life and high resale value provide extra savings. See your Willys dealer for an on-the-job demonstration today.

The 'Jeep'®

family of 4-Wheel-Drive vehicles

WILLYS...makers of the world's most useful vehicles

**Model CJ-5 shown*

WILLYS MOTORS, INC., TOLEDO 1, OHIO

NOW... CHANCE PIKE POLES ARE LAMINATED!

For greater uniformity... greater rigidity!

Now... Chance Pike Poles are made by bonding together carefully selected Douglas fir boards. Laminated Pike Poles have many advantages over the old, single board pike pole. They're more rigid. They're more uniform. Each board reinforces the other.

SAFETY PIKE — Point can be reversed as shown in circle, for safety in handling and transporting between jobs.

PLASTIC PROTECTED

Chance *laminated* Pike Poles are available with tough Maplac plastic coating. Splintering of the wood is eliminated. Lost-time hand injuries, caused by splinters, are avoided. *IT PAYS TO BUY HIGH QUALITY IN A PIKE POLE.* Only on a Chance pike pole will you find the steel reinforced butt which protects the end of the pike. And only *laminated* Chance pike poles are available with Maplac protection.

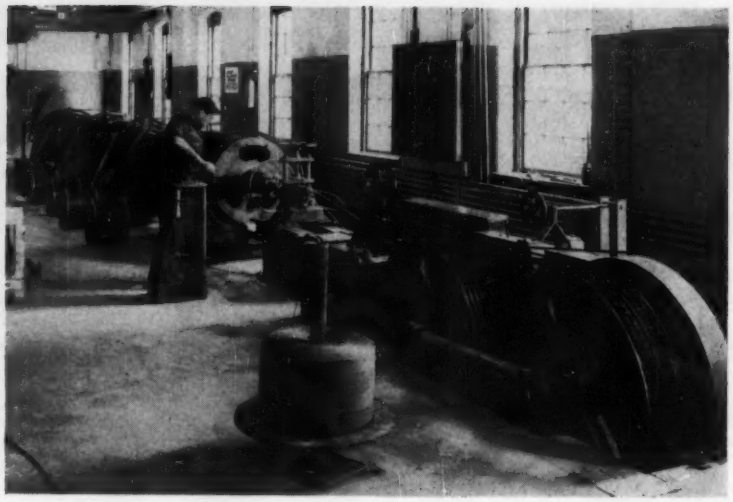
Write for the full story today.

CT35-1A

A·B·CHANCE CO.

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA



Wire Rope Closer Triples Production

Equipped with a direct power take-off, this "one-man" tube closer has tripled wire rope production at Wilkes-Barre, Pa., plant of American Chain & Cable Co, Inc, according to a recent company announcement. The machine lays strands of wire into ½-in. wire rope at a rate of about 10,000 ft/hr. Speeds for smaller diameter wire decrease in proportion to size. The firm's American Cable and Hazard Wire Rope divisions make wire rope and slings for industrial, construction, mining and marine fields.

Smithcraft Adds to Plant; F-Lamp Fixtures Sales Up

Smithcraft Division of A. L. Smith Corp has doubled its facilities for production of fluorescent lamp fixtures. An additional plant, one reclaimed from a 50-year-old box factory adjacent to existing Smithcraft facilities in Chelsea, Mass., features highly automatized equipment including electric bonderizing and electrostatic paint spraying units.

In the recent plant dedication ceremony, company Pres Julian J. Smith noted that the fluorescent fixture industry had grown from a $16 million volume in 1941 to $200 million at present. Smith said Smithcraft sales volume had grown 40 times since it first started making fixtures in 1940.

U. S. Copper Production

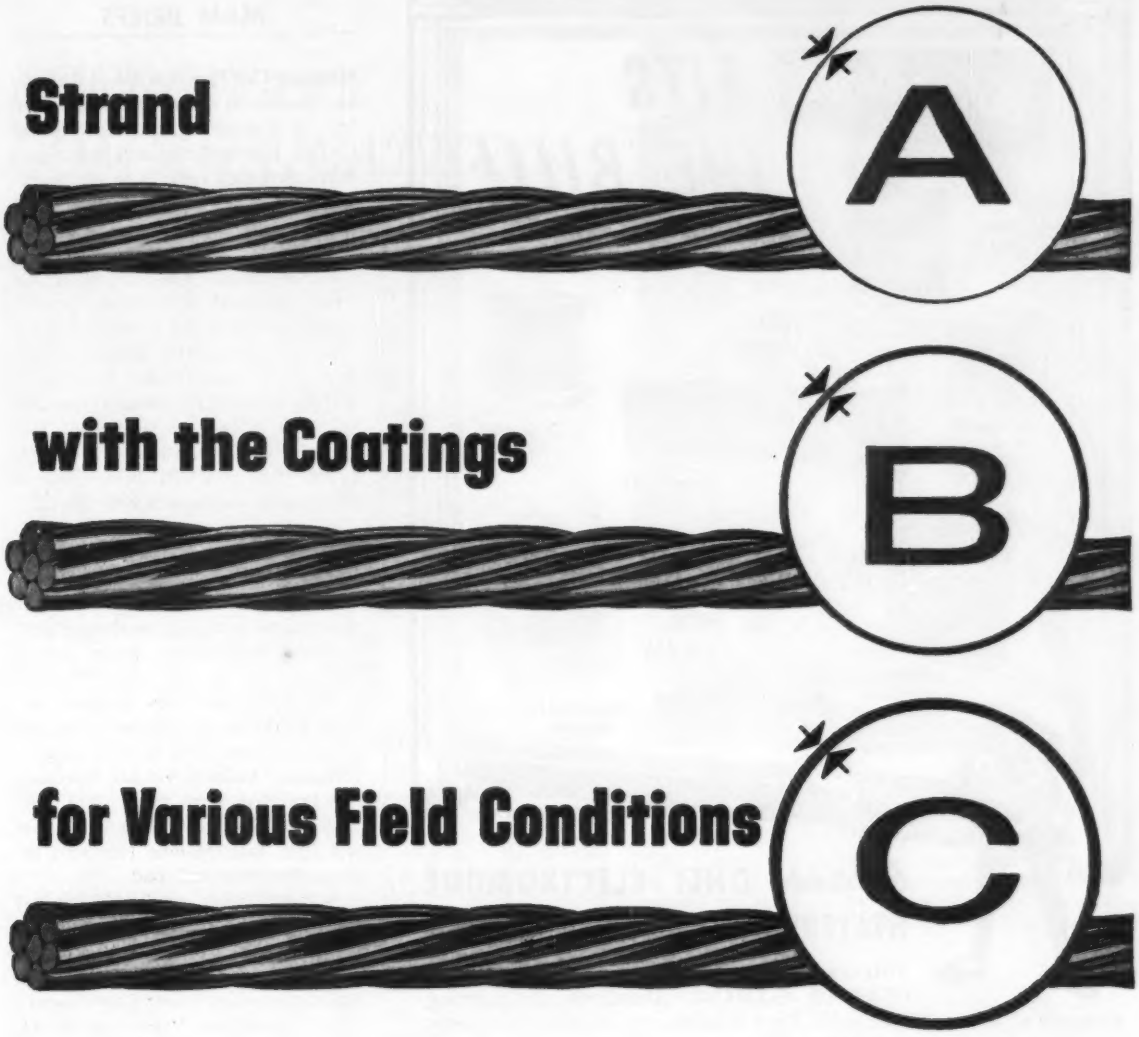
Primary copper production in U. S. amounted to 95,400 tons in April, according to the Copper Institute, New York. The amount is about 4,480 tons less than the production for March. Refined copper production was 140,032 tons in April, compared to 144,027 tons for the previous month. Deliveries to fabricators amounted to 139,927 tons in April, a decrease from the 141,590 tons in March. Refined copper stocks totaled 54,887 tons at the end of April. This is an increase of 3,292 tons over 51,595 tons at the end of March but a decrease of 6,667 tons from 61,554 tons at the end of December, 1955.

U. S. Aluminum Production

Primary aluminum production in U. S. was 144,726 tons in April, advises the Aluminum Association, New York. This amount is a decrease of 1,169 tons from 145,895 tons produced in March but an increase of 18,332 tons over 126,394 tons in April, 1955. Total aluminum production amounted to 563,777 tons for the four months through April, an increase from 501,105 tons for the same 1955 period.

(*M & M Briefs on page* 196)

Strand A with the Coatings B for Various Field Conditions C



The life of strand depends heavily upon the protective coating that encases each wire. Hence the matter of coating is one that deserves the closest study before an inch of strand is purchased.

Obviously, corrosive conditions are not the same in all areas. They differ widely. Bethlehem meets this situation by offering strand with *three* different coating weights. The lightest, called A, is the equivalent of extra-galvanized. Coating B is twice the thickness of A. Coating C, which offers the most protection, is triple the thickness of A.

Thus it is always possible to choose a coating that will meet the conditions of any given location. Naturally, all factors being equal, the B and C coatings will greatly outlast the A, although the A-weight does have its place.

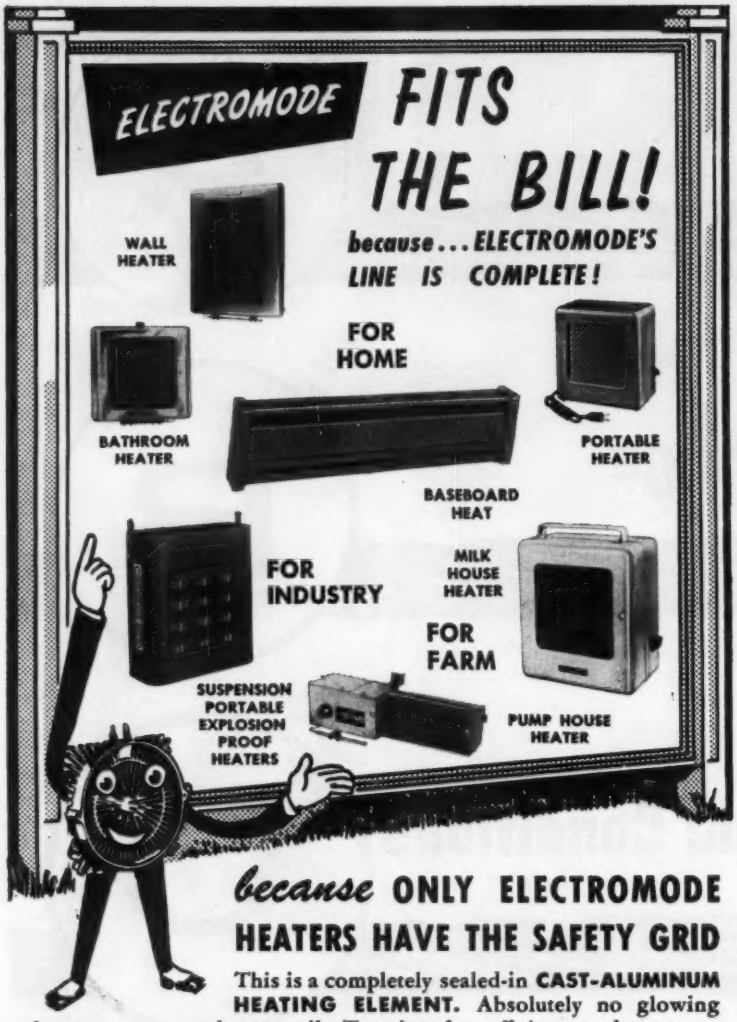
What about quality? In all three weights the *quality* of the coating is the same. The difference is merely a matter of thickness. All Bethlehem strand is coated with the same high-purity zinc, applied electrolytically. This special method of application, called bethanizing, insures a jacket so uniform and ductile that it will not crack or peel, even under repeated bending.

When you are planning new line installations, we suggest that you consider bethanized strand. Our engineers will be glad to give you full details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



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This is a completely sealed-in **CAST-ALUMINUM HEATING ELEMENT.** Absolutely no glowing elements or exposed open coils. Tops in safety, efficiency and economy. The Electromode heating element is guaranteed for five years.

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For more than a quarter century Electromode has concentrated on one specific industry—heating by electricity. From the beginning Electromode has pioneered for a quality product and has continued to expand its line to include the most modern developments in electric heating equipment to serve present day needs. As a result of Electromode's firm stand on quality, complete satisfaction has been the rule with those who either sell, install or use Electromode electric heating equipment.

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City.....Zone.....State.....

M&M BRIEFS

Standard Coil Products Co of Chicago has purchased Electronic Protection, Inc, of Chicago, a manufacturer of El-Tec. This traffic control device permits emergency vehicles to automatically turn traffic signals to red (stop) along its route.

Griscom-Russell Co of Massillon, Ohio, produced 54 feedwater heaters to supply boilers at Clifty Creek Plant of Indiana-Kentucky Electric Corp. Working pressures range from 75 to 600 psi on the shell side and from 300 to 3,000 psi on the tube side. This manufacturer's installations at Kyger Creek Plant of OVEC brings total to 63 feedwater heaters in both plants.

General Electric Co . . . Recent developments include these items:

- Changed the name of the Locke department to "insulator department" to better express the nature of its service.
- Created three new product sections of the direct current motor and generator department to serve present, forecasted business volume increases.
- Provided more than 1,800 mercury and fluorescent luminaires that will light the 156-mile Northern Indiana East-West toll road.
- Started work on 21,500-kw gas turbine-generator for Venezuela's Electricidad de Caracas. And obtained order for four more gas units for British Columbia Power Commission's Alberni plant on Vancouver Island, which includes two 19,750-kw. single cycle, single-shaft units and two 18,000-kw regenerative-cycle, single-shaft turbines.
- Announced that: **1.** work on Commonwealth Edison's Co 180,000-kw Dresden Station is "on schedule;" **2.** budget for Vallecitos atomic lab at Pleasanton, Calif., is $10 million; and **3.** by year's end the GE atomic power equipment department headquarters and manufacturing facilities will be set up at San Jose, Calif.

General Dynamics Corp, Stromberg-Carlson Division, reports completing the country's first transistorized all-electronic dial telephone switchboard. Said to be designed and built for compatibility with other U. S. telephone equipment, this first unit was delivered to the Bureau of Ships of the U. S. Navy.

MICROWAVE COMMUNICATIONS:

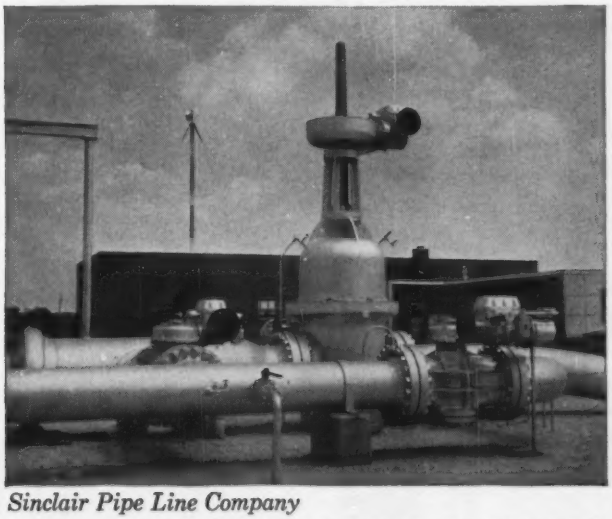
Public Service Company of Indiana, Inc.

Microwave radio aids in controlling supply of electricity for the state of Indiana. Four branches of a G-E Microwave system—combining voice and telemetering channels—originate at utility headquarters in Plainfield. From this hub regional demands are controlled according to local needs. Load control information obtained by remote control telemetering is analyzed, then transmitted to generating stations in necessary areas. Entire electrical power system is linked solidly by microwave radio.

Busy Tower

Antenna receives, transmits, or relays voice or telemetering signals. Antennas like these link headquarters with generating plants and sub-stations over a wide area.

P.S.I.'s microwave network provides utmost dependability because of standby equipment, fail safe feature, and because equipment can be concentrated at specific locations where it can be fully protected and easily maintained.



Sinclair Pipe Line Company

Microwave radio helps Sinclair coordinate flow of crude oil and oil products over many states—even turns pumps on and off. 7 voice, 4 telemetering channels link Cushing, Oklahoma and East Chicago, Indiana. Another channel permits remote control of 16 VHF radio base stations along the line which provide communication between over 100 radio-equipped vehicles and any company office in the microwave system. System is capable of providing up to 12 additional channels as needed.

Are microwave circuits your answer, too?

It depends.

What kind of service do you provide, how do you do it?

Let's assume that instant control and coordination of many functions, over long distances, are vital to your needs. Then you *should* investigate microwave because it is dependable, economical, and inexpensive to add additional circuits.

The services shown here *need* dependable voice and signal circuits. One controls the flow of crude oil and oil products over many states. The other uses microwave to link electric power facilities throughout one state.

Both use G-E Microwave Equipment for efficiency and economy. For additional microwave information, write: *General Electric Co., Microwave Equipment, Sect. X1966-11, Electronics Park, Syracuse, N.Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

dark . . . storming . . . trouble above . . . clear below

DOW

Dow weed and brush killers take the "expense" out of emergencies

RIGHT OF WAY wide and clear—ready for any emergency. Chemical weed and brush control meant this repair team arrived safely and quickly —and reduced your outage time.

Chemicals reduce line maintenance costs, too. Neater, longer-lasting and faster than cutting.

It's common sense to select the most effective control available . . . it's economically basic to consider *first* the cheapest way. Dow Brush and Weed Killers were developed to meet these qualifications . . . and typically, with Dow you have chemicals specifically designed for easy use, safe application, and your specific vegetation problem.

Special chemicals for brush, grass. Use Esteron® 245, Kuron® or Esteron Brush Killer on trees and brush. Here's hard-hitting power for effective control. Use Radapon*, containing dalapon sodium salt, for grass control. Works through leaves but kills roots, too.

Baron—simple, complete weed control. Use Baron* for control of both broad and narrow-leaved weeds. It's ideal for use around substations, storage areas and plant sites.

Application techniques are simple. Your own crew can do the job.

We'll be glad to send cost figures showing how other people saved money using Dow selective herbicides. Write THE DOW CHEMICAL COMPANY, Industrial Section, Agricultural Chemical Sales Department, Midland, Michigan.

*Trademarks of The Dow Chemical Company

you can depend on DOW AGRICULTURAL CHEMICALS

DOW

AP&L Names Teed Executive VP, Pittman VP

RALPH H. TEED

Ralph H. Teed, a vice president of Arkansas Power & Light Co since 1951, has been elevated to executive vice president. And R. R. Pittman, chief engineer, has been elected a vice president.

A veteran of 35 years in the electric utility field, Teed began as an engineer for Federal Light & Traction Co in 1921. Seven years later he became president of Citizens Electric Co. When AP&L assumed operation of Citizens properties in 1943, Teed was named Western Division manager.

Pittman joined AP&L 37 years ago as an electrical engineer, and since that time has been active in the planning and designing of the transmission and distribution system.

R. R. PITTMAN

Abbott Named Chief Engineer

NEGEA Service Corp, a subsidiary of New England Gas & Electric Association, has appointed Charles T. Abbott as chief electrical engineer.

A graduate of Massachusetts Institute of Technology, he became a junior executive trainee of Cambridge Electric Light Co, and in 1933 was named distribution engineer. Six years later he was made electrical engineer and from 1942 to 1947 also assumed system operating duties.

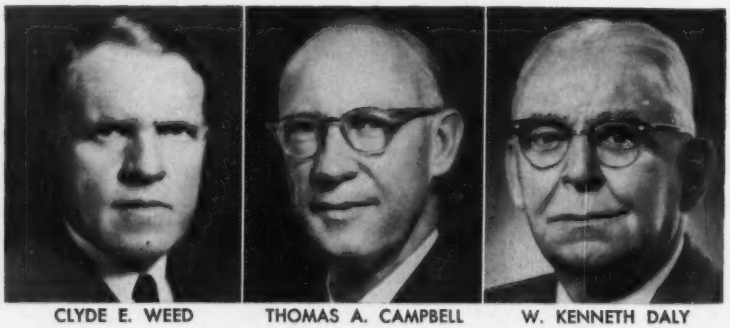
Since 1947 Abbott has been electrical engineer for the parent company. In his new post he is official chief of the electrical organization which includes subsidiary electric utilities: Cambridge Electric Light Co, New Bedford Gas & Edison Light Co, Plymouth County Electric Co, and Cape & Vineyard Electric Co, all in Massachusetts.

CHARLES T. ABBOTT

Anaconda Advances Weed, Campbell, Daly

Clyde E. Weed, vice president of operations for Anaconda Co, has been elected president of the parent company and three subsidiaries, Chile Copper Co, Chile Exploration Co, and Andes Copper Mining Co. His promotion becomes effective July 1, when Pres Robert E. Dwyer retires.

Other executive changes include advancement of Thomas A. Campbell from executive vice president of Chile Exploration and Andes Copper Mining to vice president of the parent company, and elevation of W. Kenneth Daly from Anaconda comptroller to vice president and comptroller. Campbell has also been elected president of Anaconda Sales Co, selling organization for Anaconda and its mining subsidiaries.



CLYDE E. WEED THOMAS A. CAMPBELL W. KENNETH DALY

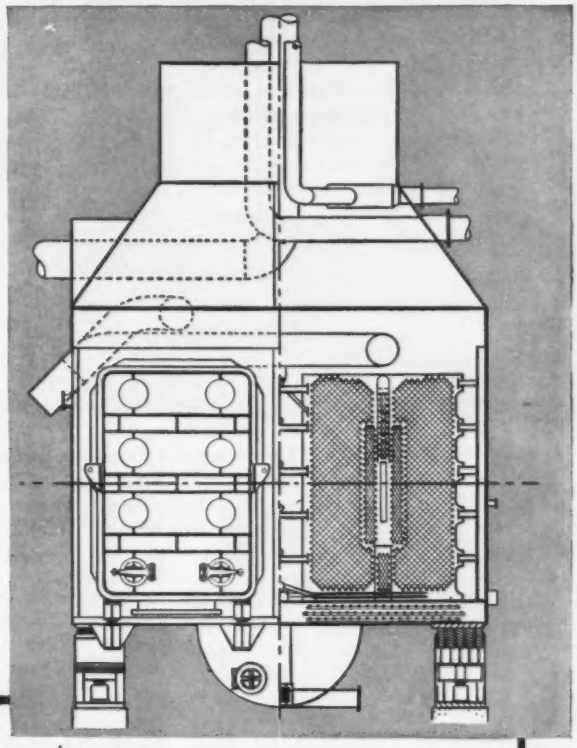
Charles Brinckerhoff, general manager of South American operations of Chile Exploration and Andes Copper Mining, has been elected vice president of both companies and will continue in his former post.

Modern Dual Bank Condensers Pioneered by C. H. WHEELER

For 40 years C. H. Wheeler has led in steam power plant condenser design, from the first Dual Bank Condenser introduced to this country in 1916 to the most modern design for today's huge turbine-generators.

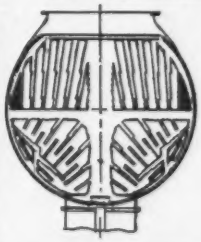
The latest C. H. Wheeler Dual Bank Condenser design for the largest metropolitan utility will provide 187,000 sq. ft. of surface to condense 1,600,000 pounds of steam per hour at 1.86 in. Hg. abs.

On the drawing boards now are new designs anticipating tomorrow's turbine requirements.

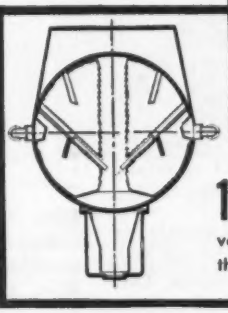


Modern Design Features.....1956

1. **Specifically designed for today's larger, more efficient generating stations.**
2. **Adaptable to your station layout.**
3. **Lower pressure drop and higher vacuum. Additional steam lanes shorten path and resistance of steam travel.**
4. **"Zero" condensate temperature depression.**
5. **DEAERATION . . . 0.01 cc. per liter is attainable.**
6. **Airtight.**



1941 Additional steam lanes allowed steam to penetrate deeper. Further improvement in pressure drop. Better deaeration.



1923 Wider steam lane. Condensate temperatures corresponded to vacuum temperatures. Oxygen content less than 0.03 cc. per liter.

1916 An early C. H. Wheeler Dual Bank Condenser. Condensate temperatures approaching vacuum temperatures were achieved.

Let us tell you how our advanced designs will meet your operating requirements. Contact your local representative or

C. H. WHEELER MANUFACTURING CO., 19TH & LEHIGH, PHILADELPHIA 32, PA.

Manufacturers also of Vacuum Equipment • Marine Auxiliary Machinery • Centrifugal, Axial and Mixed Flow Pumps

C.H. Wheeler OF PHILADELPHIA

Seidel Elected Engineering VP

Glenn E. Seidel has been appointed to the newly created corporate position of vice president in charge of engineering for Minneapolis-Honeywell Regulator Co.

Seidel, who has served as a vice president in charge of engineering at the company's Minneapolis plants since 1952, has been associated with the organization in various capacities for nearly 14 years. During that time he was successively field engineer, engineering supervisor, and manager of development engineering. Before his appointment as vice president, he served as director of the company's ordnance division.

GLENN E. SEIDEL

PERSONAL BRIEFS

Wisconsin Electric Power Co has appointed **G. R. Black** commercial and industrial sales manager, and **E. M. Sobota,** formerly supervising industrial engineer, succeeds Black as superintendent of the power sales division. **A. F. Falk** was named assistant superintendent of the special service division, and **R. W. Pray** becomes supervising industrial engineer, power sales division.

New chief mechanical engineer of the NEGEA Service Corp is **George H. Gowdy,** who will assume responsibility for the design, construction, and operating problems of NEGEA affiliates. Gowdy is former mechanical engineer with the service corporation.

Richard W. Sampson has been appointed assistant vice president of Michigan Gas & Electric Co, and **Einar G. Martinsen** is new secretary, controller, and assistant treasurer. Sampson is former operating superintendent and Martinsen previously served as assistant secretary and assistant treasurer. Resigning as secretary and treasurer is **J. P. Sherwood.**

Carl G. Erickson retired from his professional electrical engineer's post at Northern Indiana Public Service Co June 1 after 27 years of continuous service with the company.

Recent changes at International Harvester Co include appointment of **Michael F. Peckels,** former manager of consumer relations department, as director of consumer relations; and promotion of **William O. Maxwell** from assistant manager of consumer relations department to manager.

Federal Pacific Electric Co's **James A. Kerr,** formerly assistant to the vice president in charge of sales, has been named director of public relations. He will continue to serve as administrative assistant.

Connecticut Light & Power Co's **Calvin T. Hughes,** vice president and consulting engineer, was one of six men recently named by **Gov Abraham A. Ribicoff** to a committee to help guide the state's development of peacetime uses of atomic energy. Hughes will represent the state's electric utility industry.

Electric Storage Battery Co has designated **Charles J. Cresswell** as general auditor . . . **John E. Gaffney** is new personnel manager of Federal Telephone & Radio Co, a division of International Telephone & Telegraph Corp . . . **Harold J. McCormick** has been appointed director of advertising and sales promotion of Motorola, Inc.

Forrest A. Whitacre, currently assistant general manager of Essex Wire Corp's Paranite Wire & Cable Division, has been named general manager following the retirement of **E. W. McDaniel,** vice president and general manager of the division.

William C. Parker has been named manager of New York public relations for Westinghouse Electric Corp to succeed **Charles P. Johnson** who resigns July 1. Parker is former public relations manager for the company's electric appliance divisions . . . Recently named manager of marketing and distribution for Westinghouse Consumer Products divisions is **Richard J. Sargent,** who will assume certain responsibilities formerly assigned to **John F. Myers,** vice president . . . Replacing Sargent is **John J. Anderson,** new manager of the company's major Appliance Division. He is succeeded as manager of the Portable Appliance Division by **S. J. Stephenson.**

Central Hudson Gas & Electric Corp has designated **Raymond G. Erickson,** previously editor of the company's employee publication, as assistant secretary.

Laurence E. Frost, formerly staff assistant in the office of Consolidated Edison Co of New York's president, has been appointed assistant to the vice president Charles B. Delafield. He will be engaged in special assignments.

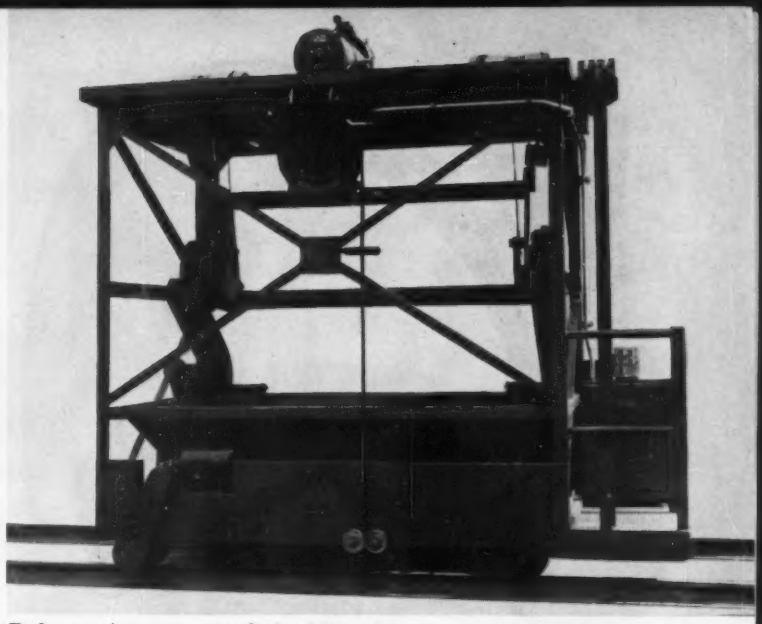
OBITUARY

Leon E. Seekins, 65, president of Lowell Electric Light Corp from 1938 to 1951, died recently at Tewksbury, Mass. Seekins, previously vice president and general manager, retired in 1951 for health reasons.

John Carlos Ryan, 57, a retired Montana Power Co vice president, died recently at his home in Great Falls.

Chester A. Corney, 63, vice president in charge of engineering and construction for Boston Edison Co since December 1955, died recently at Belmont, Mass. Corney, who joined the utility in 1922, previously served as superintendent of engineering and assistant vice president.

TRASH RAKE... PACECO STYLE



Rake carrier moves to desired location . . .

. . . Rake drops to desired depth . . . tilts to horizontal position to catch trash . . . raises, and dumps!

This Paceco designed trash rake is now giving efficient, effective service on dams. It is low in first cost and economical and fast in operation.

Paceco specializes in custom-built equipment for electric generating projects. We design and manufacture cranes, hoists, gates, penstocks and allied heavy equipment.

Some units we build direct from the buyer's plans. In many instances, however, Paceco engineers work with the buyer *at the designing stage*. Experience has proved this consultation may sharply lower initial cost, improve operational efficiency and reduce maintenance.

For over 30 years, many of the country's leading utilities have enjoyed Paceco's quality control, engineering skills and price economies — all under *one responsibility*. Your inquiry is requested for preliminary discussion or invitation to bid —

Send for Paceco's illustrated brochure, "Custom Designed Equipment for Hydro-Electric and Steam Power Plants and Water Works."

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CF&I GALVANIZED STEEL STRAND

for guy, messenger and ground wires

You'll find that an ever-increasing number of public utilities, transit companies and similar organizations are depending upon CF&I for their guy, messenger and weldless overhead ground wire requirements.

That's because CF&I offers a complete line of top-quality galvanized 7-wire* twisted steel strand that's carefully quality-controlled by CF&I throughout *every* stage of production. This quality control is important to you! It's your assurance that CF&I Strand is always made from steel that has exactly the right chemical and physical properties to fill your needs . . . and that this steel is carefully drawn, galvanized and stranded into a product that'll give years of satisfying service.

Next time you need strand, talk over your requirements with your nearby CF&I representative. He'll be happy to give you complete details on the CF&I Strand that's best for your job.

CF&I Strand For Public Utility And Similar Applications Fully Meets Or Exceeds The Latest Applicable ASTM Specification (A-122 For Guy And Messenger Wire; A-363 For *Weldless* Overhead Ground Wire).

*Also available in 3-wire construction. 3740

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SALES ASSIGNMENTS

COMPANY STAFFS

Infilco, Inc, has transferred Joseph M. Young from his post as field sales engineer in the southwest area to headquarters of the Ion-Exchange Department in Tucson, Ariz. Lee Hiser replaces Young in the southwest territory.

Hotpoint Co has named John E. Clarke merchandise manager, television receiver department.

Miller Co's Illuminating Division has appointed William N. Hancock as sales representative for the Cleveland territory. He was previously head of customer services at the Utica, Ohio, plant.

Orangeburg Manufacturing Co, Inc, has designated Carl Franklin Arnold sales manager, north central district, encompassing the states of North Dakota, South Dakota, Nebraska, Kansas, and Missouri. Headquarters are in Kansas City, Mo.

Philco Corp's Government & Industrial Division has named Fred F. Bartlett as sales manager-broadcast; Kenneth C. Moritz as sales manager-communications; and William F. Tait as sales manager-export and special accounts.

J. F. Pritchard & Co's new sales representative for the Republic of Mexico is A. Gonzalez-Flores.

Ray-O-Vac Co has appointed Edwin E. Turner district sales manager in the newly formed territory comprising northern Florida and sections of southern Georgia and Alabama, with headquarters in Jacksonville, Fla.

Westinghouse Electric Corp's Sturtevant Division has appointed W. Y. Humphreys Pittsburgh district manager and E. F. Morse Cleveland district manager. . . . New national sales representatives for electric housewares are R. C. Ellsworth and W. R. Cooney. . . . Bryant Electric Co, wholly owned Westinghouse subsidiary, has designated Clyde W. Foster sales manager for wiring devices and Ronald W. Essig as sales manager for appliance controls. Robert D. Howells has been named manager, marketing services.

REPRESENTATIVES

General Electric Co's Photo Lamp Department has appointed Grey Advertising Agency, Inc, as its agency effective July 1.

Porcelain Products, Inc, has named Dolan-Feldhaus Co as new Hi-Voltage Division representative for the Minneapolis territory, which includes North Dakota, South Dakota, Minnesota, and a small portion of northwestern Wisconsin.

J. A. Weaver Co has designated S&W Electric Co, Colorado, as representative in a four state area, including Colorado, Utah, Wyoming, and Montana.

MODERN BUSINESS

AND MODERN SCHOOLS

NEED EACH OTHER MORE THAN EVER!

This has been a great year! America is building and replacing and thus moving faster than ever before.

Only one thing. Will the labor market keep pace?

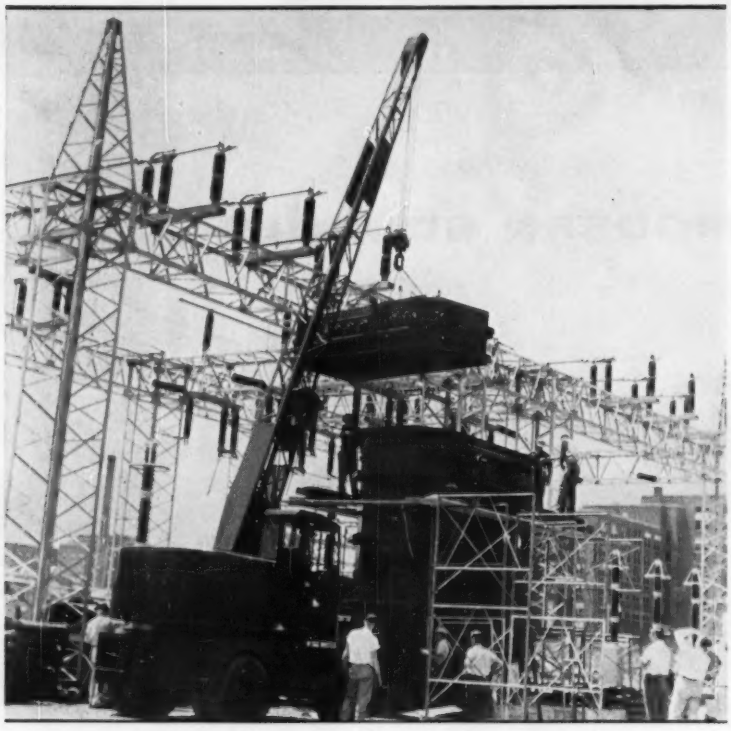
That's where schools are important. If your company isn't helping community groups to get modern schools, it's not apt to get the skilled people it needs. Self interest, civic spirit, or both, you should make schools your business, too.

PUBLIC SERVICE • ADVERTISING COUNCIL

Want to find out how to help in *your* community?
Get specific information by writing:
Better Schools, 9 East 40th Street, New York, N. Y.

Cut costs 101 ways*

COLES CRANES



Now—AVAILABLE L. P. GAS-POWERED

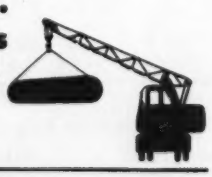
Available gasoline, diesel, or L.P. gas-electric powered, COLES is the *universal* materials handling tool for utilities' storage *and* field work. Self-propelled or truck-mounted, COLES combines the flexibility, smoothness, and precision control needed to handle any load with safety, speed, and precision. Public utilities find COLES CRANES economical, too.

- Shortest turning radius of any full circle slewing mobile crane
- No gears to shift; grouped finger-tip controls for maximum operating simplicity.
- Self-resetting safety limit switches protect loads and crane
- Perfect visibility of load at all times

*WRITE FOR BOOKLET *"101 COST-CUTTING WAYS"* listing the many jobs a Coles can do

COLES CRANES, INC.
Joliet 6, Illinois

Consult your classified telephone directory for the distributor nearest you, or call us direct, collect.



ACCURATE SPOTTING: All loads lowered under power for careful placement. Safety devices are integral with a COLES.

SMOOTH POWER: COLES develop highest torques at lowest revs for controlled, balanced power.

Coordinated Protection

(*Continued from page* 109)

be little telephone wire resistance in the circuit, and the power system impedance must be dominant.

An example of coordination planning, taking current decay into account, is shown in Fig 8. The total time to lockout for 50 and 140-amp reclosers is shown where the sequence is one fast and three retarded operations. It can be seen that the 50-amp recloser locks out for any initial value of fault current above about 700 amp even for the maximum decay rate. For current decay rates less than maximum, the 50-amp recloser locks out for values as low as 300 amp. This occurs when the decay rate is zero.

The 140-amp recloser offers a much more difficult coordination problem in that it locks out only for larger values of current, as can be seen from the dotted line. This dotted line represents an intermediate rate of current decay, and it appears that fusing of the telephone wire may occur before lockout. In general, the 140-amp recloser does not offer positive coordination in this situation.

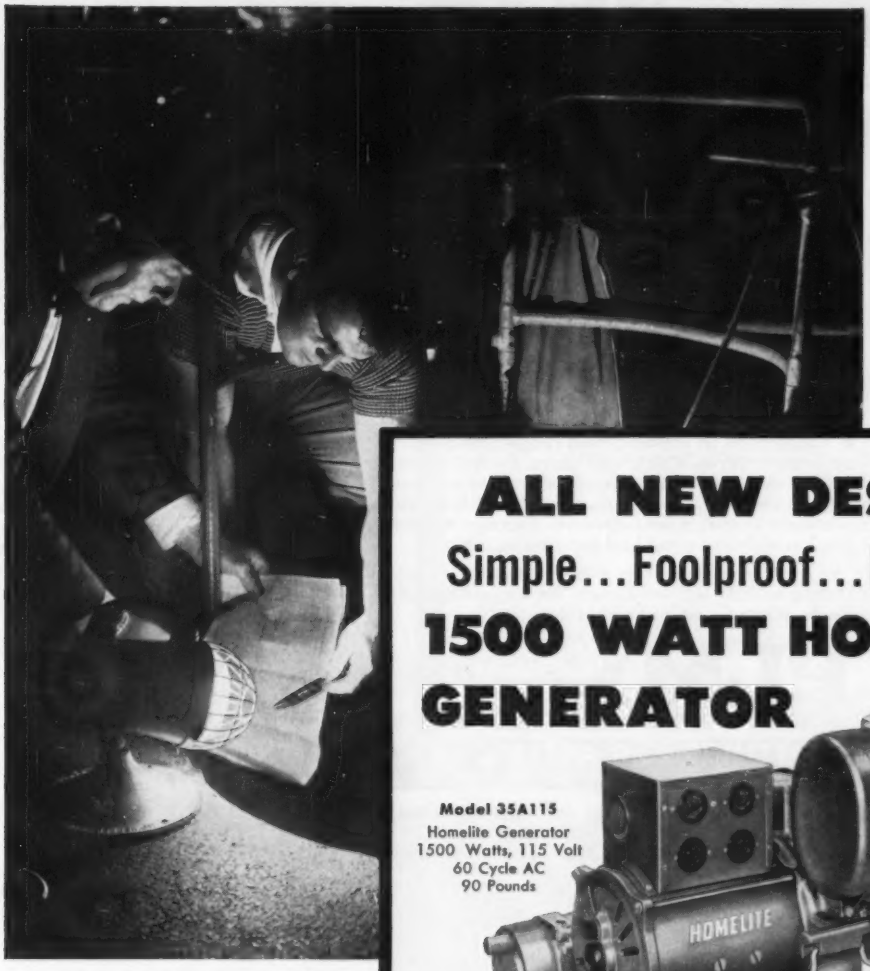
Austria Power Problem Brings 10% Restriction

Austria, once considered Europe's classic hydro power country, is grappling with a short supply of energy.

The devastating 1955-56 winter finally resulted in a decree ordering a two-week, 10% reduction in industrial power consumption. But a temperature rise eased demand and increased water run-off, permitting a return to normal usage recently.

The prospects, though, of rationing power deliveries are becoming imminent, according to the Austrian Power Distribution Agency, unless the country's hydro construction program is stepped up.

Last year, Austria's output totaled 3,600-million kwhr, a 9.3% increase. But consumption was 12.4% higher than 1954, with the difference being supplied by imports, mainly from West Germany. An inability to deliver large blocks of power next winter from West Germany has darkened Austrian outlook. During the two weeks of restricted use, West Germany delivered a peak of 3.5-million kwhr daily.



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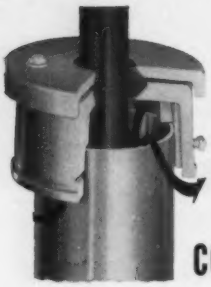

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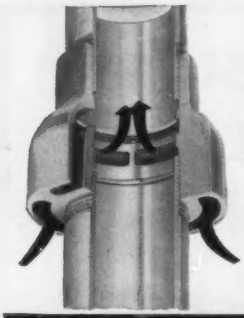
PLM Type CV Ventilating Cable Support for use at top of conduit where cable extends into air.

PLM Type BCV Ventilator for use at bottom of conduit.



● Cable risers in non-ventilated conduit often build up temperatures which can shorten service life. PLM Ventilating Cable Supports provide support for risers in conduit, but permit escape of heated air ...materially reduce temperatures...increase service life...provide increased load-carrying capacity.

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BOOKS

(*Continued from page* 190)

A World Directory of Utilities

Electricity Undertakings of the World 1955-56, The Electrical Journal Red Book—Fifth Edition. Edited by Norman H. Codling. Published by Benn Brothers Ltd, 154 Fleet St, London, EC4. 623 pages. Price 30s.

This ambitious reference book sponsored by "The Electrical Journal" lists in detail the electrical authorities and technical equipment of the British utilities. There are many other useful features such as the constitution of the Central Authority, rate structure for wholesale quantities of power, names of executives in the Central Authority.

Judging by United States entries, this reference book is very weak in its attempt to cover electrical projects and utilities in areas outside Britain and the Commonwealth Countries. For instance only 150 of the nearly 4,000 electric utilities in the U. S. are listed. Many of these are small municipal systems. Only 26 states are listed as having electricity although every urban and some 93% of the farm homes in the U. S. have central station electricity.

Physics Clarified

Modern Physics: A Textbook for Engineers. By Robert L. Sproull. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 491 pages, illustrated. Price $7.75

This book, an analytical approach to 20th century physical concepts, covers a wide field and thus can not present each subject in detail. However it leaves nothing to be desired as an introduction to what modern physics actually encompasses.

Most of the text is devoted to quantum mechanics which the author describes as the "heart" of modern physics. His approach is very interesting and informative, especially for the practicing engineer whose college physics curriculum ended with classical mechanics. For the author first presents the experiments which show the necessity for the quantum theory, then follows with a description of the theory and application material.

Other portions treat fundamental particles, assembly of particles, the atom, molecules and forces holding them together, electrical, thermal, and magnetic properties of solids, semiconductors, and applied nuclear physics. Each chapter is prefaced with a short introductory section. This greatly aids the reader by conditioning him as to what he will learn and what to expect. Numerous illustrations and drawings depict devices and instruments that can be used to demonstrate the physical principles involved.

This book is strongly recommended to engineers as an introduction to

modern physics. It is written for engineers, not physicists. And although it requires the engineer to brush up on calculus, the effort is well rewarding.

Reference on Material

Materials Handbook—8th Edition. By George S. Brady. Published by McGraw-Hill Book Co, 330 W 42nd St., New York, N. Y. 1,022 pages. Price $11.00

An encyclopedia of practical facts on approximately 10,000 materials, the book is divided into two parts: Part I—Materials, their properties and uses; and Part II—Elements of material economics. This edition brings the book up-to-date by including information on the newer heat resistant materials.

Covered in the first part are pertinent facts on metals, alloys, refractories, abrasives, woods, and many other materials. They are arranged and indexed for quick reference. Descriptions are of a general nature. No attempt is made to provide an exhaustive treatise.

The second part presents basic information on the economic geography of material resources, weights, measurements, etc.

This book should be useful to purchasing agents, designers, and others who are responsible for material selection.

Epics of Engineering

Engineering in History. By Richard Shelton Kirby, Sidney Withington, Arthur Burr Darling, and Frederick Gridley Kilgour. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St, New York 36, N. Y. 537 pages, illustrated. Price $8.50.

To seven great events of history which have stimulated engineering development the 20th century will add automatic control, contends this new book. And its authors proceed to trace the development of each of these events and its effect on history. For this book is more than a history—it is a record of engineering and its relation to history.

But, observe the authors, engineering has not evolved in a vacuum. It has contributed much to human societies, and in turn these societies have conditioned the growth of engineering. This facet the authors present capably, for the team comprises two historians and two engineers, all experienced in their fields.

Practicing engineers would enjoy reading this non-technical account of their profession. Those who find themselves called upon to address non-technical audiences will find it a valuable source in itself and, by virtue of its numerous bibliographies, a dependable guide to more extensive information about selected aspects. This book should be in every utility library and available to every utility executive who speaks in public.

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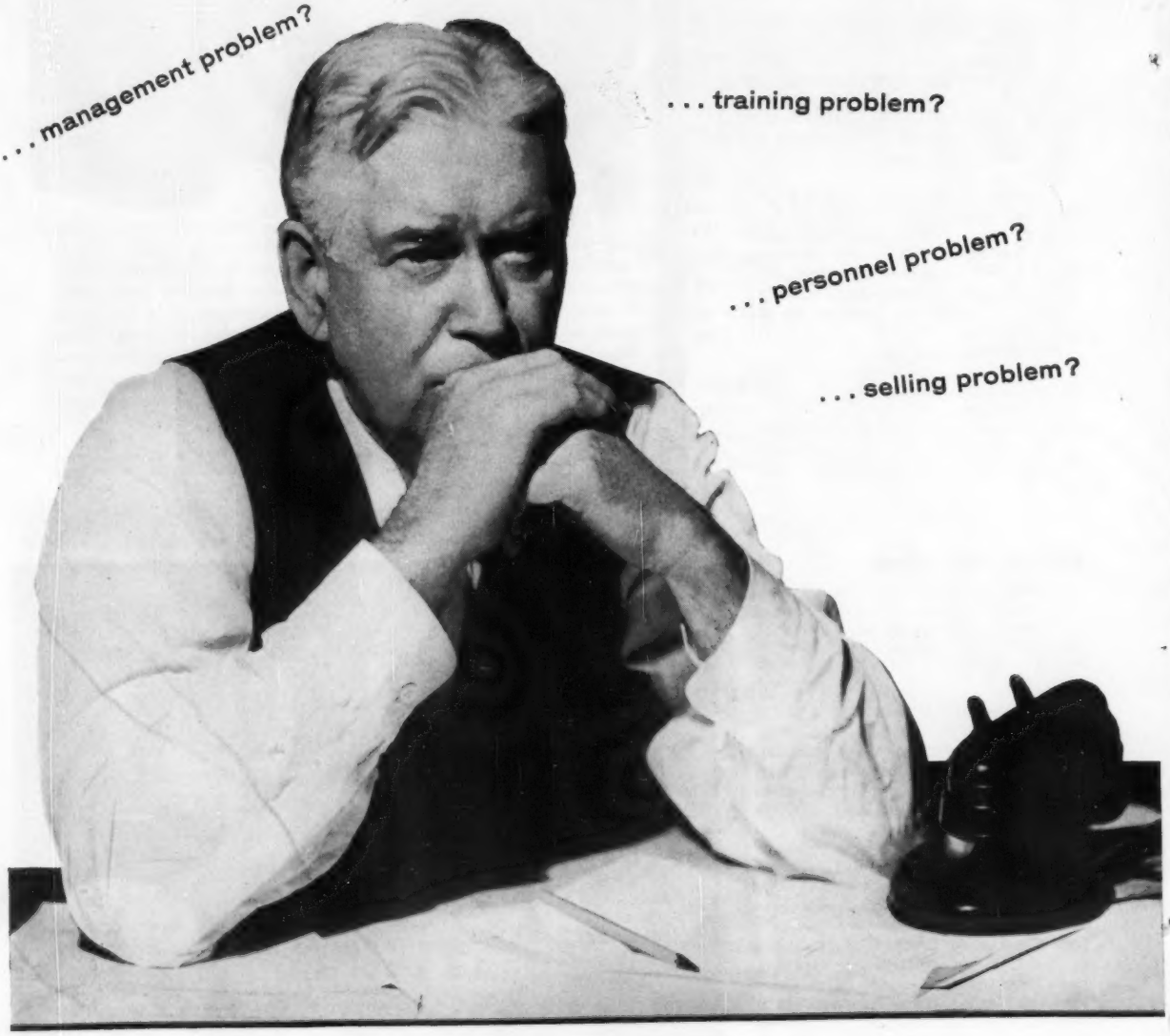

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4. To encourage all constructive efforts to improve the standards and quality of advertising.
5. To avoid unfair competition.
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GENERAL ELECTRIC

PCEA Explores

. . . opportunities and needs of the industry and urges cooperation of all segments at its annual convention

Opportunities that await the industry's attention and growing needs that demand its attention shared program billing at the 39th annual convention of the Pacific Coast Electrical Association held recently in Las Vegas.

Full and continued cooperation among all segments of the electrical industry was called for to insure a realization of the goals of the Live Better Electrically and Housepower programs. On the other hand, planning on a ten-year basis, creative salesmanship, realistic management development programs, and greater use of research were underscored as deserving more industry consideration.

In setting the meeting theme, Sam W. Scott, PCEA president, said opportunity in the form of LBE and Housepower is knocking at the industry's door. Open the door, take the programs in, and put them to work for you now, he emphasized.

Use of Sales Tools Urged

These programs are the tools that can help sell the value of the industry to the public, said Art W. Hooper, executive director, National Association of Electrical Distributors. In using these tools, Hooper advised, focus attention on electricity's contributions to our American way of life, emphasize the factor of safety that can be realized through adequate wiring, and encourage recognition of electrical pioneers.

Hooper urged that the same spirit of cooperation found among all segments of the industry in local-level promotions must prevail on the national scene. The industry cannot succumb to attitudes of the past which resulted in individual groups saying "the heck with industry-wide cooperation, let's get our share" of the consumer's dollar, he declared.

During 1956, the electrical industry will spend a minimum of $8,760,000 to convince the public of the need for residential rewiring and of the desirability of electrical living. This conservative estimate, said P. Howard Farley, sales promotion manager, National Electrical Contractors Associa-

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IRWIN Wilmington, Ohio — HEX SHANK WOOD BITS

tion, is based on money budgeted as of January 31.

While 20 million homes are in need of rewiring, he pointed out, only 5% of the homeowners have any idea that rewiring is necessary. And the housewife is the "prime mover" if adequate wiring is to be installed, Farley added. The public holds the local utility in high regard but is suspicious of the motives of the electrical dealer who in turn is uninformed on the broad subject of and need for rewiring, and the electrical contractor has shown little interest in promoting residential rewiring, he said.

"More and more forward-looking businesses are learning how to do an effective job of five-year planning," said Philip D. Reed, chairman of the board, General Electric Co. This is a healthy trend, he said, but if we are to get ahead of the job, business leaders must free themselves of this year's plans and look at least ten years ahead.

Perils of Slow-Down Stressed

In the face of our favorable future market, Reed stated, there are businesses that "are slowing down for the next dip in the road when they should be accelerating for the sharply-rising curves ahead."

"Masses of people—with or without money—do not in themselves guarantee good business," said Tyler Macdonald, vice president, Hixon & Jorgensen, Inc. This fact has been proven, he added, in cities where newspaper strikes deprived the public of this all-powerful selling medium and retail sales of all goods plummeted. The answer, claimed Macdonald, is that markets are made, not born, and that the making of these markets is advertising's secret weapon.

Creativity Called Key to Progress

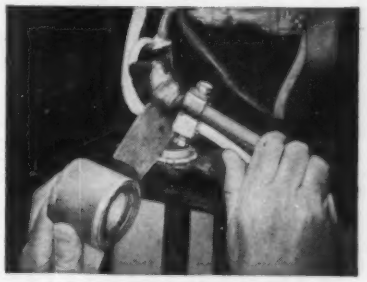
The greatest thing in the world today—creativity—has been and will continue to be the key to progress; without it salesmanship is worthless, stated Edward R. Taylor, assistant to the president, Motorola, Inc.

"You have to create the need . . . the desire . . . the demand on the part of the public for your product. After you've created this sale, you have to turn around and create unhappiness with the thing that has just been sold. You have to create the idea that they need more of it or that they need something better," he explained.

(*Continued on page* 214)

Volseal...

the new high dielectric putty...



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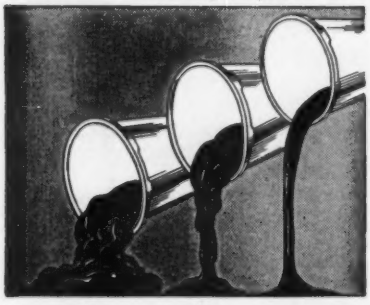

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PCEA Explores

(*Continued from page* 213)

The first requirement of management development is to define the functions of planning, organizing, staffing, directing, and controlling, said Dr Harold D. Koontz, professor of business policy, University of California in Los Angeles. This is followed by establishment of clear-cut goals plus the knowledge of what management training can accomplish, he said. The logical and practical approach, Koontz added, is to find what the needs are for management development, who needs it, and how these needs can best be satisfied. Koontz stated that management development still remains a primary task of managers, if not the most important one.

Training Program Pitfalls Cited

He pointed out some pitfalls in present management-development programs. There is too strong a tendency, said Koontz, to rely upon formal devices such as university programs, company seminars, and conference-type training when the best trainers of management are the managers themselves. Another pitfall, according to the professor, is the implication that enrollment in a program represents a step toward promotion; actually, primary emphasis should be placed on increasing the quality of managers in their present jobs. Finally, said Koontz, there is the delusion among top executives that the management-development program will be self-activating, once the word has been given.

Appraising Hints Offered

Industrial psychologists can help a company more by guiding the line officer in making his own appraisals than by doing the appraising themselves, stated Dr Gilbert Brighouse, professor of industrial psychology, Occidental College. Illustrating this theme, he said in the appraisal of new employees or managerial candidates, the most important role is to assist with the best interview methods available and with the judicious use of tests. The industrial psychologist can exercise his sensitivity to "the climate" of a company and can suggest to management the most important areas where training is needed, Brighouse observed.

Research is emerging as the new factor in our economic complex, said

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Dr Jesse Hobson, consultant and former director of Stanford Research Institute. Both basic and applied research, he stated, comprise the foundation for our supply of energy, brainpower, and plans and ideas for the future. He warned that brainpower, like fossil fuel, will be in increasingly short supply. There is a need for a new kind of professional service—organized brainpower—in which research scientists, engineers, designers, economists, market experts, public relations people, and other experienced professional talent can work under common leadership in the best creative environment on the problems of many firms, he said.

In meeting the responsibilities of business, effect must be given to those democratic ideals that are our national heritage, said A. G. Patterson, president, Square D Co. Whatever the size of a company, "it must be prepared to protect the dignity and freedom of the individual to think, speak, or write, to work or quit, and to organize or leave an organization," he stated.

The present shift in Russian policy in placing the blame on Stalin is an attempt to influence neutral countries and to destroy the North Atlantic Treaty Organization, observed Robert Gros, vice president, Pacific Gas & Electric Co. He expressed concern over the Soviet theory of competitive co-existance as a complex economic attack that may confuse and perplex other governments. Gros stated that the Russians still believe communism will triumph in the end.

Maytham Named PCEA Head

Elected as the next president of PCEA was Walter J. Maytham, vice president, Westinghouse Electric Corp. Newly elected to directorships were Robert H. Gerdes, vice president, Pacific Gas & Electric Co, and E. E. Karsten, vice president and general manager, Gough Industries, Inc.

For their services to the association and the electrical industry, recognition awards were presented to members who have retired from active business life. These members and their former companies are: Ray W. Turnbull and Allan Jones, both of GE; A. E. Hollaway, Percy Pine, G. H. P. Dehlman, and William de Waard, all of San Diego Gas & Electric Co; James Pollard and E. G. Stahl, both of PG&E; Ralph H. Hopkins, Westinghouse; Dave Harris, GE Supply; Henry C. Rice, Southern California Edison Co.

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Write giving full particulars regarding personal history and work experience.
Recruiting Supervisor, Box 148

ARABIAN AMERICAN OIL COMPANY
505 Park Avenue New York 22, New York

REPLIES (Box No.): Address to office nearest you c/o this publication, Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Wanted—Electrical Engineer, can be recent graduate, for electrical control design work in an Engineering Department. Location at mining operation in northern New York. Salary commensurate with experience. P-1987, Electrical World.

Product Engineer—Graduate engineer with utility experience in transmission and distribution desired, for design and quality control with company manufacturing power line connectors, splices and deadends. Will work closely with sales and production departments as well as other engineers. We know this is the same old ad, but it got us a good man last time, and he has been promoted. Salary open. Reliable Electric Company, 3145 Carroll Avenue, Chicago 12, Illinois.

Electrical Engineer, Graduate, five to ten years of work experience. Board work on illumination and power. Position available on staff of service organization of large office building in the Middle Atlantic Region. Please advise education, experience, and salary expected. Reply held confidential. P 1820, Electrical World.

Operations Assistant Engineering graduate with utility operating experience and some knowledge of utility accounting. Work directly under direction of Vice President on analyses of property operations of diversified utility. Heavy travel. Submit complete resume and starting salary desired. P-1879, Electrical World.

Austrian manufacturer drumswitches and other industrial controls with office located New York requires energetic sales engineer able travel throughout USA. Drawing commission bright future. If interested write Box P-1943, Electrical World stating all qualifications which should include some electrical engineering experience.

EMPLOYMENT SERVICES

Salaried Personnel, $5,000-$30,000. This Confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, P. O. Box 674, Manchester, Vermont.

Salaried Positions $5,000 to $35,000. We offer the original personal employment service (established 46 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 558 Brisbane Bldg., Buffalo, N. Y.

POSITIONS WANTED

Jr. Distribution Engineer age 23 desires position with public utility. PW-1565, Electrical World.

Mechanical Engineer, desires career position in utility field with future opportunity toward management, experienced, in power plant operation, betterment engineering, start-up work, willing to travel and relocate for right position. PW-1903, Electrical World.

WORK WANTED

Structural Engineer expert on switching stations, powers and all outdoor structures. Available on consulting basis. WW-1891, Electrical World.

UTILITIES ENGINEER

with accredited degree plus two or more years professional experience with a Public Utility; Public Utility Regulatory Agency; allied industry involved in utility construction. Write to: Mr. R. J. Pajalich, Secretary, Calif. Public Utilities Commission, State Building, San Francisco.

FIELD SALES REPRESENTATIVES

Opportunity for E.E. grad. or equivalent; must have successful sales or associated experience to represent an established, but expanding, multi-plant, electrical equipment manufacturer. The Kentucky-West Virginia territory, Oklahoma & Texas Panhandle territory and Maryland, Washington, D. C., Delaware and eastern territory are open. These three territories must be filled by top flight men.

Salary depends on your experience and qualifications. Bonus plan, profit sharing plan, merit increases, expenses and car furnished. Send details, experience, education, age, and etc. to

RW-1657, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

SALES ENGINEER

with utility experience and the ability to handle all phases of new business connected with utilities. Age: Under 45. Liberal salary and traveling expenses.

P-1650, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

MANUFACTURER'S REPRESENTATIVE AVAILABLE

Relocating to Northwest. 6 successful years of utility management. 3½ successful years of regional and national sales to electrical distributors and utilities. Financially responsible. Reply

RA-1898, Electrical World
68 Post St., San Francisco 4, Calif.

Electrical Engineer—married, good health, 25 years experience in utility operations, construction, system planning, including labor relations. Desires responsible position with Utility Company.

PW-1973, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

Don't forget the

Box Number

WHEN answering the classified advertisements in this magazine, don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES · EQUIPMENT - USED or RESALE

UNDISPLAYED —RATES— DISPLAYED

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

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Send NEW ADVERTISING to Classified Advertising, P. O. Box 12, N. Y. 36, N. Y.

DIESEL ENGINES — POWER MACHINERY

DIESEL GENERATOR SETS—Stationary—Portable—Mobile
MOTORS and GENERATORS—100 KW to 1500 KW

A. G. SCHOONMAKER COMPANY, INC.
Main Office **Box 516, Sausalito, Calif.** Sausalito 1630 ***Branch*** **30 Church St., N. Y. 7, N. Y.** Digby 9-4350

CONTRACT WORK WANTED

British Public Company with wide production facilities in light engineering, electrical, electronic fields interested in contacting an American Company with view to manufacturing new products for United Kingdom market.

CW-1761, Electrical World
330 W. 42 St., New York 36, N. Y.

FOR SALE
SUBJECT TO PRIOR SALE

200 Westinghouse Type CO, Inverse Time Relays, Rated 0.5/2.5 Amperes, 60 Cycle, with Universal Operation Indicator. In Modern Flexitest Cases Which Can Be Mounted Either Flush or Projection. All in First Class Condition. Can Be Used Interchangeably. Styles Nos. 1271197, 1273197, 1545024 and 1545012. If Interested Contact N. C. Stirewalt, V. P., Central Illinois Public Service Company, Springfield, Illinois.

PERIODICALS

A.I.E.E. Transactions wanted to buy for cash and other technical and scientific periodicals. E. W. Ashley 27 E 21; N.Y.C. (10).

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4709) will be received at Denver, Colorado, until July 12, 1956, for furnishing control board, supervisory control and telemetering equipment, battery charger, and AC distribution board for Grand Forks substation, Missouri River Basin Project, North Dakota. Delivery is desired within 180 to 240 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

"SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

TRANSFORMERS

SPECIAL PURCHASE

five carloads
13800 volt transformers
sizes 25 KVA to 250 KVA
new and slightly used

What can you use?
Write for list and prices

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—

- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus

Branch Office:
Houston—Walnut 3-4580
FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL WIRE and CABLE Co.
2929 N. Paulina St. **Chicago 13, Ill.**
EAstgate 7-4777 **Code: UNIWIRE**

LARGE POWER EQUIPMENT

Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?

BELYEA COMPANY INC.
51 Howell St. **Jersey City, N. J.**

MEETINGS CALENDAR

JUNE

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS — 48th Annual Convention, Ambassador & Chelsea and Ritz Hotels, Atlantic City, N. J., June 11-14.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-Annual Meeting, Statler Hotel, Cleveland, Ohio, June 17-21.

AMERICAN SOCIETY OF TESTING MATERIALS—59th Annual Meeting & 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J., June 17-22.

FIFTH WORLD POWER CONFERENCE—Vienna, Austria, June 17-23.

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS—Semi-Annual Meeting, Washington, D. C., June 18-20.

CANADIAN ELECTRICAL ASSOCIATION—Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 18-20.

ELECTRICAL EQUIPMENT REPRESENTATIVES ASSOCIATION—Summer Meeting, La Playa Hotel, Carmel, Calif., June 20-23.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Accounting & Business Practice Section, Multnomah Hotel, Portland, Oregon, June 21-23.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—Accident Prevention Committee Conference, Hotel Roanoke, Roanoke, Va., June 22.

WISCONSIN UTILITIES ASSOCIATION—Accounting Section Convention, Schwartz Hotel, Elkhart Lake, Wis., June 24-26.

MICHIGAN ELECTRIC ASSOCIATION—Annual Convention, Grand Hotel, Mackinac Island, Mich., June 24-27.

ATOMIC INDUSTRIAL FOORUM, INC—Conference sponsored jointly with Denver Research Institute, Denver, Colo., June 25-26.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Summer and Pacific General Meetings, Fairmount Hotel, San Francisco, California, June 25-29.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION—Annual Meeting, Iowa State College, Ames, Iowa, June 25-29.

INTERNATIONAL ELECTROTECHNICAL COMMISSION—Deutches Museum, Munich, Germany, June 26-July 6.

AMERICAN CHIEF ENGINEERS' ASSOCIATION—Northwest Power Show, Minneapolis Auditorium, Minneapolis, Minn., June 28-July 1.

JULY

SOUTHEASTERN ELECTRIC EXCHANGE—Personnel Administration Section, General Oglethorpe Hotel, Savannah, Ga., July 12-13.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION—Council Meeting, Geneva, Switzerland, July 16-21.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—Annual Convention, Sheraton Palace Hotel, San Francisco, Calif., July 24-27.

COLUMBIA UNIVERSITY INDUSTRIAL & MANAGEMENT ENGINEERING DEPARTMENT—Fifth Annual Utility Management Workshop, Arden House, Harriman, New York, July 29-Aug. 10.

AUGUST

WESTERN ELECTRONIC SHOW AND CONVENTION—Pan Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif., Aug. 21-24.

SEPTEMBER

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Accounting Section, Cascadian Hotel, Wenatchee, Wash., Sept. 11-14.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—3rd Annual Electrical Conference of the Petroleum Industry, Kansas City, Mo., Sept. 12-14.

EDISON ELECTRIC INSTITUTE—Organization Meeting, sponsored jointly with AGA, Edgewater Beach Hotel, Chicago, Ill., Sept. 13-14; Industrial Relations Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 17-19; Meter & Service Committee, Purdue University, Lafayette, Ind., Sept. 24-26.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—38th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 14-15.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Hotel Statler, Boston, Mass., Sept. 17-21.

INSTRUMENT SOCIETY OF AMERICA—11th Annual Instrument-Automation Conference and Exhibit, New York Coliseum, Sept. 17-21.

ATOMIC INDUSTRIAL FORUM, INC—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

PENNSYLVANIA ELECTRIC ASSOCIATION—Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Steering Committee, Blackstone Hotel, Chicago, Ill., Sept. 26; Workshop Conference, Blackstone Hotel, Chicago, Illinois, September 26-28.

OCTOBER

EDISON ELECTRIC INSTITUTE—Prime Movers Committee, Hotel Radisson, Minneapolis, Minn., Oct. 1-3; Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio., Oct. 15-16; Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y., Oct. 18-19.

***ILLINOIS INSTITUTE OF TECHNOLOGY**—12th Annual National Electronics Conference, sponsored jointly by AIEE, Institute of Radio Engineers, University of Illinois, and Northwestern University, Hotel Sherman, Chicago, Ill., Oct. 1-3.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5.

INDIANA ELECTRICAL ASSOCIATION—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 3-5.

***SOUTHEASTERN ELECTRIC EXCHANGE**—Sales Conference, Tides Hotel & Bath Club, St. Petersburg, Fla., Oct. 3-5.

***INTERNATIONAL ASSOCIATION OF ELECTRIC LEAGUES**—Sheraton-Cadillac Hotel, Detroit, Mich., Oct. 3-6.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 7-10.

INTERSTATE POWER CLUB—Hotel Martinique, New York City, N. Y., Oct. 8.

ILLINOIS INSTITUTE OF TECHNOLOGY—Conference on Computer Applications, Chicago, Ill., Oct. 9-10.

***INTER-INDUSTRY FARM ELECTRIC UTILIZATION COUNCIL**—National Power Use Workshop, Milwaukee Auditorium, Milwaukee, Wisc., Oct. 15-16.

***UNIVERSITY OF TEXAS**—Ninth Power Distribution Conference, University Batts Auditorium, Austin, Tex., Oct. 22-24.

AMERICAN STANDARDS ASSOCIATION—38th Annual Meeting and 7th National Conference on Standards, Hotel Roosevelt, New York, Oct. 22-24.

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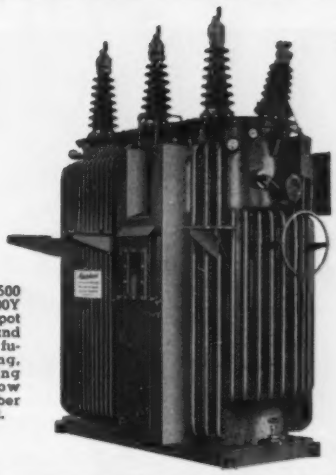
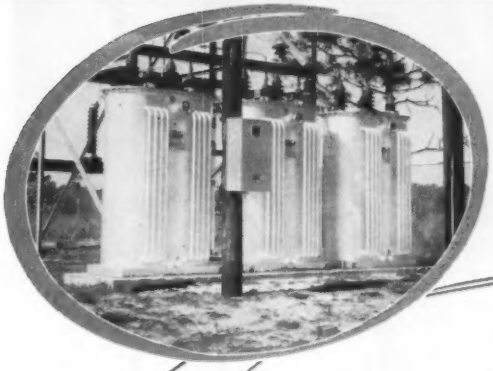
* Additions this week.

power transformers

Power transformer, OISC, 2,000 KVA, three phase, 60-cycle, 23,000 to 2,400 volts. Has four 2½% above and four 2½% below high voltage regulating taps with externally operated no load tap changer.



Power transformer, 1,500 KVA, three phase, 69,000Y to 480/240 volts. Hot spot temperature indicator and control, provisions for future forced air cooling, pedestals for mounting lightning arresters, low voltage terminal chamber and gas seal equipment.



When dependability is a factor...

Dependability in a transformer to you means trouble-free performance and long service life. To us, this means dependable construction.

For example, at STANDARD . . .

Tanks are built of rust-resisting steel, arc welded seams and tested under pressure. Liberal clearances are allowed from the windings and leads to tank and cover.

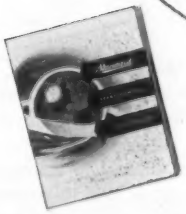
On the outside . . . attractive, long-wearing finishes with a primer coat and two finish coats of blue-gray enamel . . . on the inside, a lining of red oxide.

Covers are carefully and accurately fitted.

Tap changers and accessories efficiently placed with a specially designed tap changer switch.

These are just a few of the construction factors which STANDARD builds into Power Transformers. Look to STANDARD when you want dependability.

Everything Points To...



WRITE FOR BULLETIN CL-50

Tells the story with words and pictures of STANDARD'S complete line of transformers, and how they perform for every class of service . . . on the job.

Standard®

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Night, weekend bill-paying featured as . . .

WWP Opens New Service Office in Spokane

Washington Water Power Co recently opened this attractive service office in downtown Spokane to facilitate bill-paying and customer information.

Facilities for night and weekend bill-paying are the main service features of the $76,000 office. On its walls are displayed five translucent color photographs of scenes from Washington Water Power's service area. One of these photographs is of the company's Cabinet Gorge Dam.

Lighting for the 2,400-sq ft office won a regional contest for "My Most Interesting Lighting Job" and was second in a similar contest at the recent convention of the Pacific Northwest chapter of Illuminating Engineering Society. The lighting design was executed by T. W. Beadle, illuminating engineer for Washington Water Power.

PR & A BRIEFS

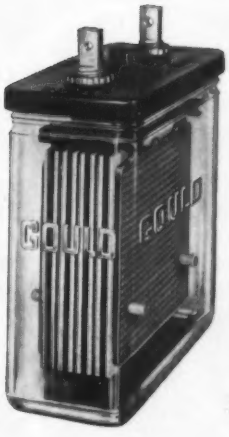
● A live show of substation operations will be given the public by floor-to-ceiling windows in the new Glenora substation, scheduled for operation in October by City of Edmonton, Alberta. Windows will also contain appliance displays.

● A program to improve public access to two lakes above High Falls and Caldron Falls Dams was proposed recently by Wisconsin Public Service Corp to Stephenson town board in Marinette County. The program calls for a number of access roads across land owned by the utility. At the end of each road a piece of adjoining water front would be designated as a public boat landing.

● "Private vs Public Power" is a new 16-page booklet recommended by National Association of Electric Companies as a "compact and understandable presentation of the current situation with respect to Federal power policy." The booklet is published by Channing L. Bete Co, Inc, Box 506, Greenfield, Mass. Prices are: 2 to 99 copies, 10¢ each; 100 to 999, 8¢; 1,000 to 9,999, 7¢; 10,000 to 50,000, 6¢ each.

● To keep the public informed on progress of atomic and solar research, Arizona Public Service Co has developed a slide film for showings to stockholders, public groups, and employees. The film graphically points out the need for developing new sources of energy to offset future demands on existing fuel supplies.

"They Should'a Bought GOULD Research-built BATTERIES"



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

You'll have no regrets if you standardize on Gould Research-Built Batteries. As a matter of fact, you'll be mighty glad you did. These advance-design batteries are tested and proved in Gould's own research laboratory and pilot plant before they go into factory production. That's why Gould Batteries have earned an enviable reputation for exceptional performance and long, trouble-free service life.

Gould's Field Engineering Service—finest in the industry—helps you keep your Gould batteries working at top capacity . . . adds months to their normal life. Get more power per dollar—with GOULD!

Always Use Gould-National Automobile and Truck Batteries

GOULD BATTERIES

GOULD-NATIONAL BATTERIES, INC.
Trenton 7, N. J.

"BETTER BATTERIES THROUGH RESEARCH"

©1956 Gould-National Batteries, Inc.

How High Is Your Stock Priced?

New theory determines how high utility common stocks are priced during period of rising interest rates; developed by Goodbody & Co, New York

"A somewhat new theory" for determining how high utility common stocks are priced during a period of rising interest rates has been developed by T. W. Locke of Goodbody & Co. He first used the theory during the money market squeeze of 1953.

Locke gives this explanation for his theory: "Yields are often deceptive. The only way to figure out just how high utility stocks are in price is to estimate what the yield would be on a 75% payout of estimated earnings for this year—not last year . . .

"Yield must be related to dividend paid and we prefer to use the industry average of 75%. In this way we put all stocks on equal basis."

The accompanying table lists 25 of a group of 40 electric utility stocks that Locke studied. The table shows the April 24th market price, current dividend and yield, estimated earnings for this year, and the dividend if it were 75% of estimated 1956 earnings. Then the resulting yield at current market prices on such a dividend is given.

"We feel this is the best way of making a comparative evaluation of a group of utility stocks at any given time," Lock concludes.

He also makes these other observations: "Numerous utility companies are turning to common stock financing as the best way to get new money now. For the prices of most utility stocks have not declined to a really important extent, whereas the new bond offerings have been having a difficult time at higher and higher interest rates. We are likely to see more utility common financing as long as market conditions are favorable . . ."

A copy of the complete research study can be obtained from T. W. Locke, Goodbody & Co, 115 Broadway, New York 6, N. Y.

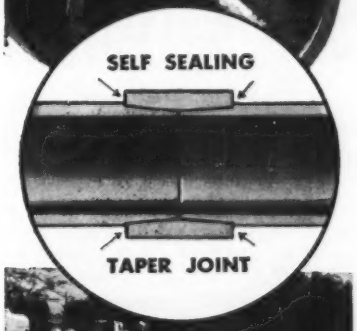
Comparative Yield Potential of 25 Companies on Estimated 1956 Earnings

Company	Market Price 4-24-56	Dividend	Yield	Estimated 1956 Earnings	Present Market ÷ 1956 Earnings	Dividend if 75% of Est. 1956 Earnings	Resulting Yield
American Gas & Electric*	53	$2.16	4.1%	$3.30	16.0	$2.48	4.70%
Baltimore Gas & Electric	34	1.60	4.7	2.30	14.8	1.70	5.10
Central Hudson Gas & Electric	16⅝	0.80	4.9	1.10	15.1	0.83	5.00
Central & South West	37½	1.40	3.7	2.20	17.0	1.65	4.40
Cleveland Electric Illuminating	38¼	1.60	4.2	2.70	14.4	2.05	5.20
Commonwealth Edison	41⅛	2.00	4.9	2.80	14.7	2.10	5.10
Consolidated Edison of N. Y.	47⅛	2.40	5.1	3.25	14.5	2.44	5.18
Dayton Power & Light	47¾	2.20	4.6	3.40	14.0	2.55	5.30
Detroit Edison	34¼	1.80	5.3	2.65	12.9	2.00	5.80
Florida Power & Light	42¼	1.20	2.8	2.30	18.4	1.75	4.10
General Public Utilities	36⅛	1.80	5.0	2.80	12.5	2.10	5.80
Gulf States Utilities	38⅛	1.60	4.2	2.15	17.7	1.60	4.20
Idaho Power	34½	1.20	3.5	2.05	16.8	1.54	4.50
Illinois Power	52¼	2.60	5.0	3.80	13.8	2.85	5.50
Middle South Utilities	28¾	1.50	5.2	2.10	13.8	1.60	5.50
Ohio Edison	53¾	2.48	4.6	3.85	14.0	2.90	5.40
Oklahoma Gas & Electric	37⅜	1.70	4.5	2.45	15.3	1.84	4.90
Pacific Gas & Electric	53	2.40	4.5	3.40	15.6	2.55	4.80
Public Service Electric & Gas	33⅜	1.80	5.4	2.35	14.2	1.75	5.20
Rochester Gas & Electric*	45	2.40	5.3	3.30	13.6	2.48	5.50
South Carolina Electric & Gas	19⅜	1.00	5.2	1.45	13.4	1.10	5.70
Southern Co.	21¾	1.00	4.6	1.50	14.5	1.12	5.10
Texas Utilities	39¼	1.28	3.3	2.20	17.8	1.65	4.20
Union Electric	27⅞	1.40	5.0	1.80	15.5	1.35	4.80
Virginia Electric & Power	42	1.60	3.8	2.80	15.0	2.10	5.00

*New dividend rate company has indicated it plans after pending stock split.

Source: Goodbody & Co.

SMOOTH BORE!



Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. EW-66 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®

FIBRE CONDUIT

FINANCIAL BRIEFS

Electric utility industry will come to the market this month for over $175 million in new securities to finance its large expansion program, John F. Childs, vice president, Irving Trust Co has announced. In addition he said, another $530 million has been scheduled for other utilities, industrials, and municipals. For July, usually a light month, the industry has already scheduled around $100 million. This is on top of $350 million scheduled by gas and telephone companies.

Federal Power Commission has just issued its 1954 edition of "Statistics of Electric Utilities in the United States." For copy, write FPC, Washington, D. C., price $3.75 each.

Duquesne Light Co will pay July 1 a quarterly common stock dividend of 50¢ a share as compared with 45¢ a share in the previous quarter . . . **British Columbia Power Corp, Ltd,** will pay July 16 a quarterly common stock dividend of 35¢ a share as against 30¢ in previous quarters.

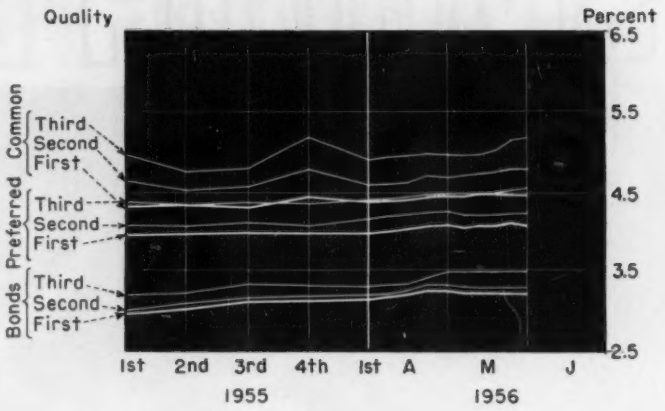
South Carolina Electric & Gas Co has placed 50,000 shares of 4.60% cumulative preferred stock with the New York Life Insurance Co and 20,000 shares with Equitable Life Assurance Society of U. S. The other 30,000 shares were sold to five other institutions. Kidder, Peabody & Co placed the entire 100,000 shares.

New England Electric System net earnings are expected to show 6% to 7% improvement in 1956 if present trends continue, Pres Irwin L. Moore told shareholders at the May 28 annual meeting.

Public Utility District No. 2 of Grant County, Ephrata, Wash., is planning to sell sometime next week approximately $163 million of revenue bonds due in 2005. Proceeds from the sale will finance a hydro dam at Priest Rapids on the Columbia River.

Southern Nevada Power Co has filed a registration statement with the Securities & Exchange Commission to sell 170,000 common shares publicly through William R. Staats & Co and Hornblower & Weeks.

Today's Utility Yields (%)

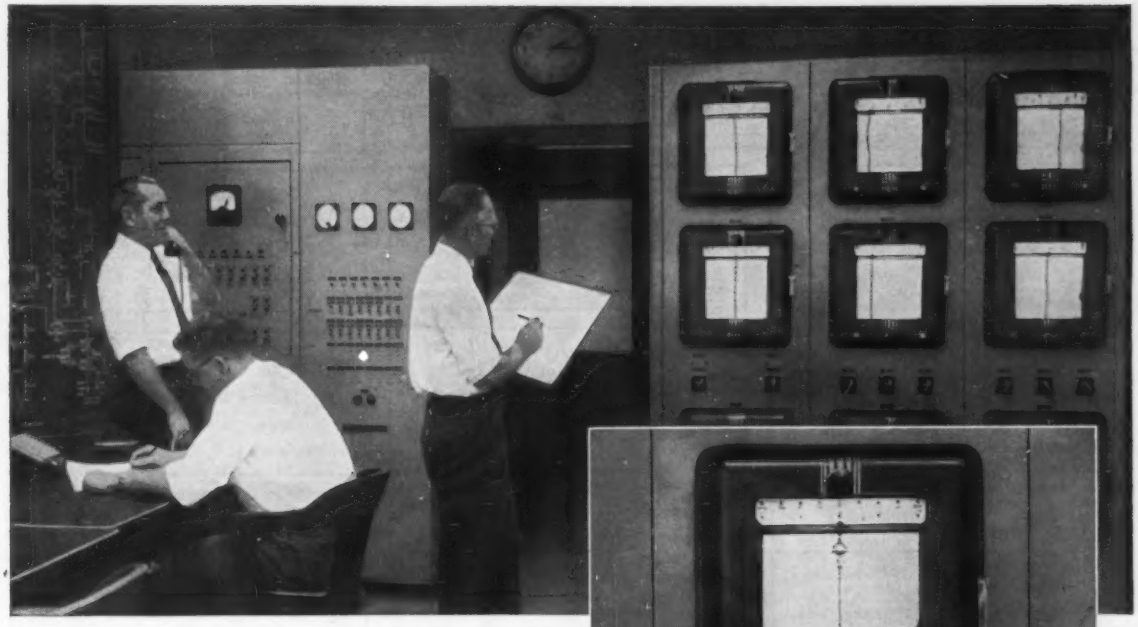


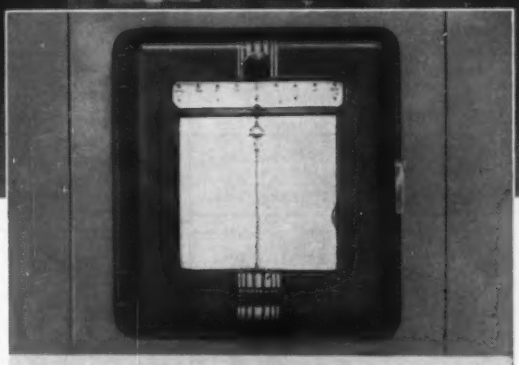
	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY.....	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
May 31.....	3.21	3.28	3.48	4.09	4.24	4.49	4.57	4.79	5.18
May 24.....	3.22	3.28	3.48	4.12	4.25	4.49	4.54	4.79	5.14
May 17.....	3.22	3.28	3.48	4.10	4.24	4.49	4.49	4.76	5.05

Utility Earnings

COMPANY	PERIOD MONTHS	ENDED	NET INCOME 1956	NET INCOME 1955	EARNINGS PER COMMON SHARE 1956	EARNINGS PER COMMON SHARE 1955
Alabama Power.....	12	April	$14,683,082	$13,327,985	$....	$....
Arkansas Power & Light.....	12	April	7,521,706	8,882,877	....	....
California-Pacific Utilities.....	12	April	727,596	650,398	2.24(a)	2.20(a)
Carolina Power & Light.....	12	April	9,764,864	8,406,472	1.69(b)	1.55(b)
Central Illinois Light.....	12	April	4,564,614	3,663,147	4.03(c)	3.15(c)
Central Maine Power.....	12	April	6,399,425	6,470,121	1.66	1.69
Central Vermont Public Service..	12	April	1,348,301	1,419,955	1.21(f)	1.31(f)
Consumers Power.....	12	April	30,687,033	27,482,495	3.32(c)	3.07(c)
Dallas Power & Light.....	12	April	7,201,228	6,617,391	....	....
Detroit Edison.....	12	April	26,976,021	23,889,284	2.43(c)	2.22(c)
Georgia Power.....	12	April	14,411,053	13,046,662	....	....
Gulf States Utilities.....	12	April	10,583,011	9,604,743	2.14	1.91
Houston Lighting & Power.....	12	April	15,890,686	13,183,308	2.66(g)	2.19(g)
Iowa Southern Utilities.....	12	April	1,407,691	1,334,036	1.71(h)	1.62(h)
Kansas City Power & Light.....	12	April	8,787,707	7,088,002	2.72(i)	2.31(i)
Middle South Utilities, consolidated.....	12	April	17,163,786	16,586,380	2.26	2.18
Montana Power and subsidiaries.	12	April	2,281,485	2,179,965	3.08	2.67
New York State Electric & Gas...	12	April	11,158,255	9,726,492	2.87(j)	2.68(j)
Ohio Edison and subsidiary.....	12	April	24,084,128	21,342,247	3.67	3.20
Oklahoma Gas & Electric.....	12	April	8,561,912	7,608,135	2.19(k)	2.13(k)
Portland General Electric.....	12	April	5,135,431	4,677,065	1.71	1.56
Public Service of Indiana.....	12	April	13,121,355	12,410,958	2.42	2.44
Public Service of New Hampshire	12	April	4,160,655	4,091,820	1.22(l)	1.39(l)
Southern Co, consolidated.....	12	April	27,840,805	23,746,914	1.42(m)	1.31(m)
Southern Indiana Gas & Electric.	12	April	2,303,752	2,666,452	1.90(n)	2.47(n)
Texas Electric Service.....	12	April	11,345,061	10,371,127	....	....
Texas Power & Light.....	12	April	10,728,274	10,110,053	....	....
Texas Utilities, consolidated.....	12	April	25,098,501	23,140,804	2.06(g)	1.96(g)
Virginia Electric & Power.....	12	April	19,980,886	17,921,368	2.66	2.37
West Pen Electric, consolidated..	12	April	17,782,228	16,365,170	2.10	1.93

Notes—(a) Based on 250,369 shares in 1956 and 239,770 shares in 1955; (b) Based on 4,830,000 shares in 1956 and 4,600,000 shares in 1955; (c) Based on average shares; (f) (based on 875,141 shares in 1956 and 867,141 shares in 1955; (g) Based on shares outstanding at close of each period; (h) Based on 754,663 shares in 1956 and 747,883 shares in 1955; (i) Based on 2,695,000 shares in 1956 and 2,450,000 shares in 1955; (j) Based on 3,337,475 shares in 1956 and 3,034,068 shares in 1955; (k) Based on 3,283,362 shares in 1956 and 2,984,783 shares in 1955; (l) Based on 2,845,335 shares in 1956 and 2,468,094 shares in 1955; (m) Based on 19,594,946 shares in 1956 and 18,087,643 shares in 1955; (n) Based on 996,363 shares in 1956 and 913,333 shares in 1955.





This Central Hudson Gas & Electric Net Interchange Deviation Recorder (middle instrument at left end of panel) gives operators two chart curves: scheduled interchange of power with neighboring systems and deviations from the schedule. For 3 hours prior to this photo, all normal ties had been closed with the scheduled interchange at zero. Because control held the schedule accurately, the two curves coincide.

200 MW SYSTEM JOINS TREND TO AUTOMATION WITH "BIG SYSTEM" AUTOMATIC LOAD CONTROL

Operating Advantages and Savings Proportionate To Those Gained On Multi-Million KW Systems

• Operating and management people on many progressive small systems have found that the principles of automatic tie-line bias control are just as applicable as on the larger power networks. Example: the experience of the Central Hudson Gas & Electric Corporation of Poughkeepsie, New York.

Before they installed automatic load control, their operators did a remarkable job of mentally calculating all the variables which must be considered in order to keep generation and demand economically in step. But "remarkable" was not good enough, because they realized that with an accelerated load growth, and the advances made in automatic dispatching, CHG&E could do still better.

They did. With the installation of automatic load control, many operating problems disappeared. Operators now meet their tie-line interchange schedules accurately — and, as a matter of fact, their regulating error is less than one per cent. Their control lets them get the full benefit of interconnected operation, and at the same time, avoid the needless and excessive upsets which could occur if their automatic system control were not in operation.

And, that's only part of the story. Today, boiler pressure and drum level fluctuations occur less frequently, and are much milder. Even the amount of telephoning between dispatchers and generating plants is less than it would otherwise be.

Naturally, we're proud of the performance of this additional Leeds & Northrup Load-Frequency Control installation. May we suggest that you can similarly move ahead by talking with L&N engineers about your own operating picture. We'd like to emphasize that these men are all seasoned load-control specialists who have a long list of successfully operating control installations to their credit.

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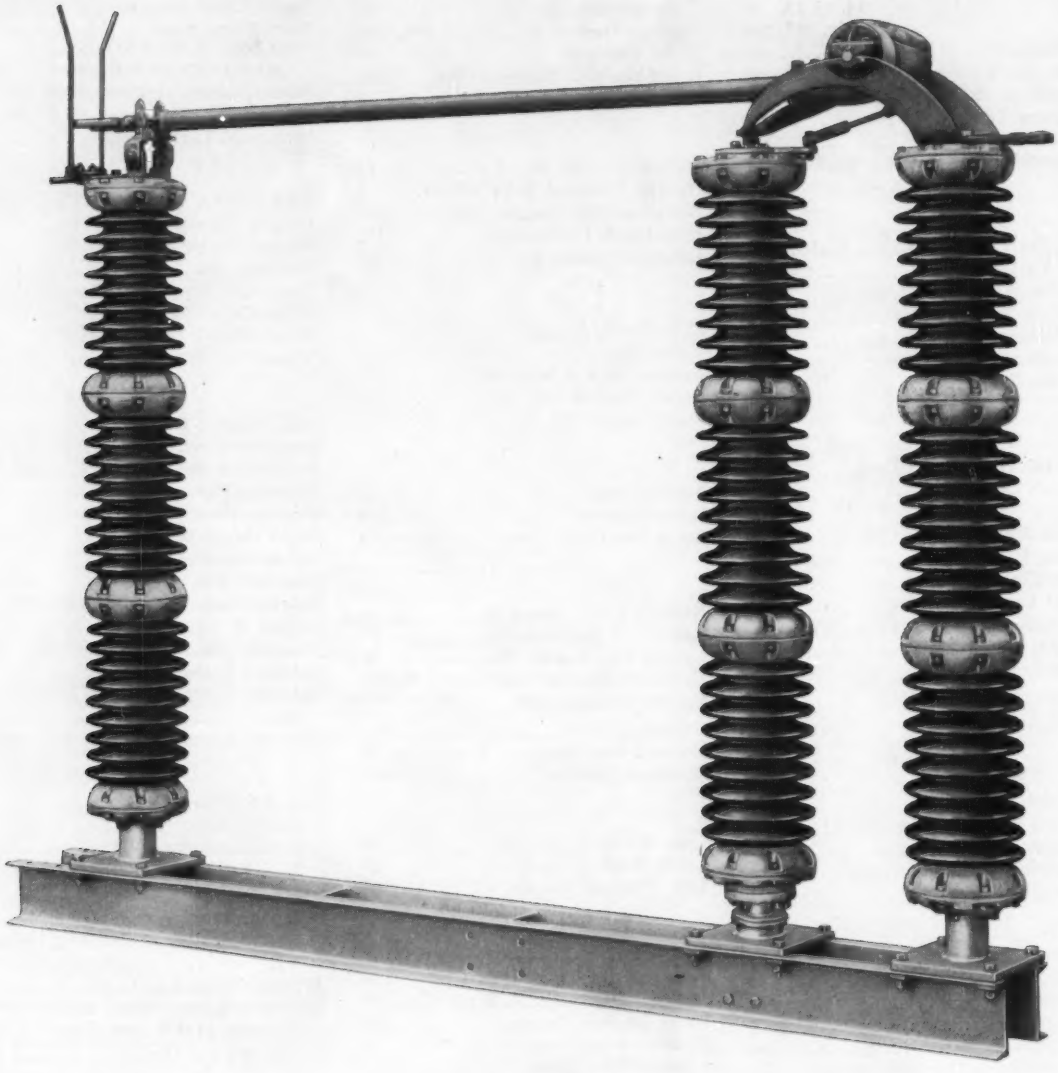

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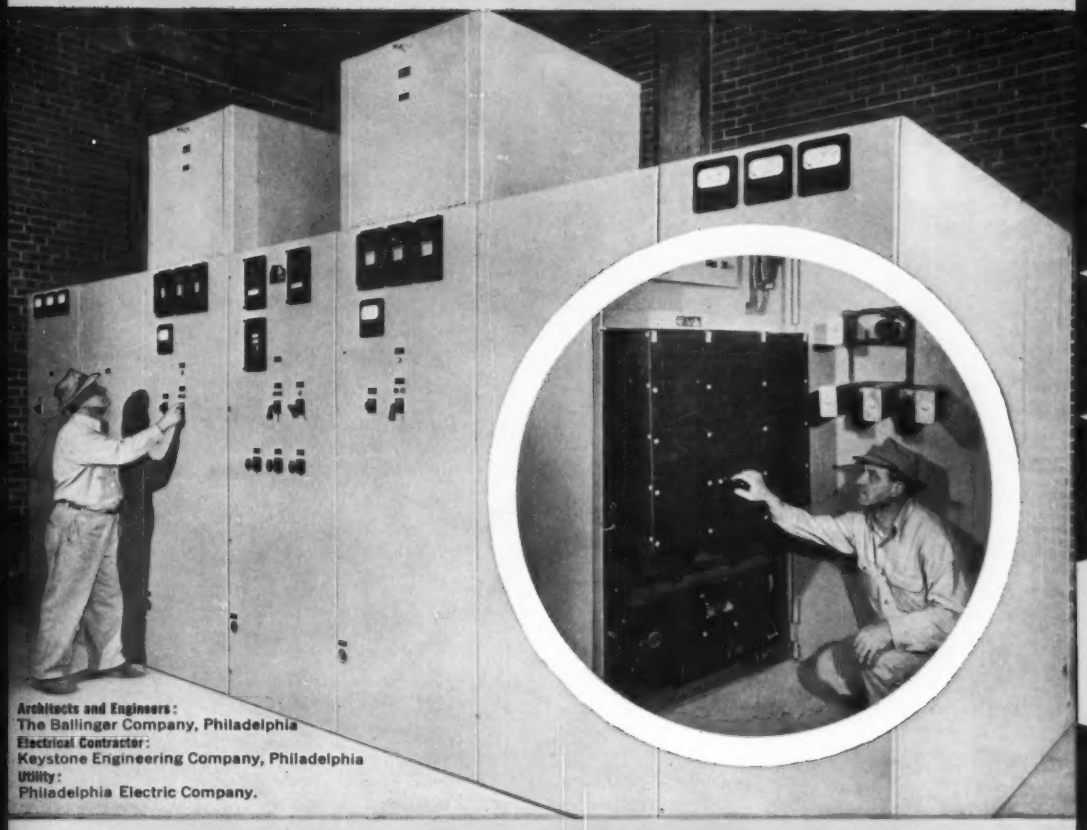

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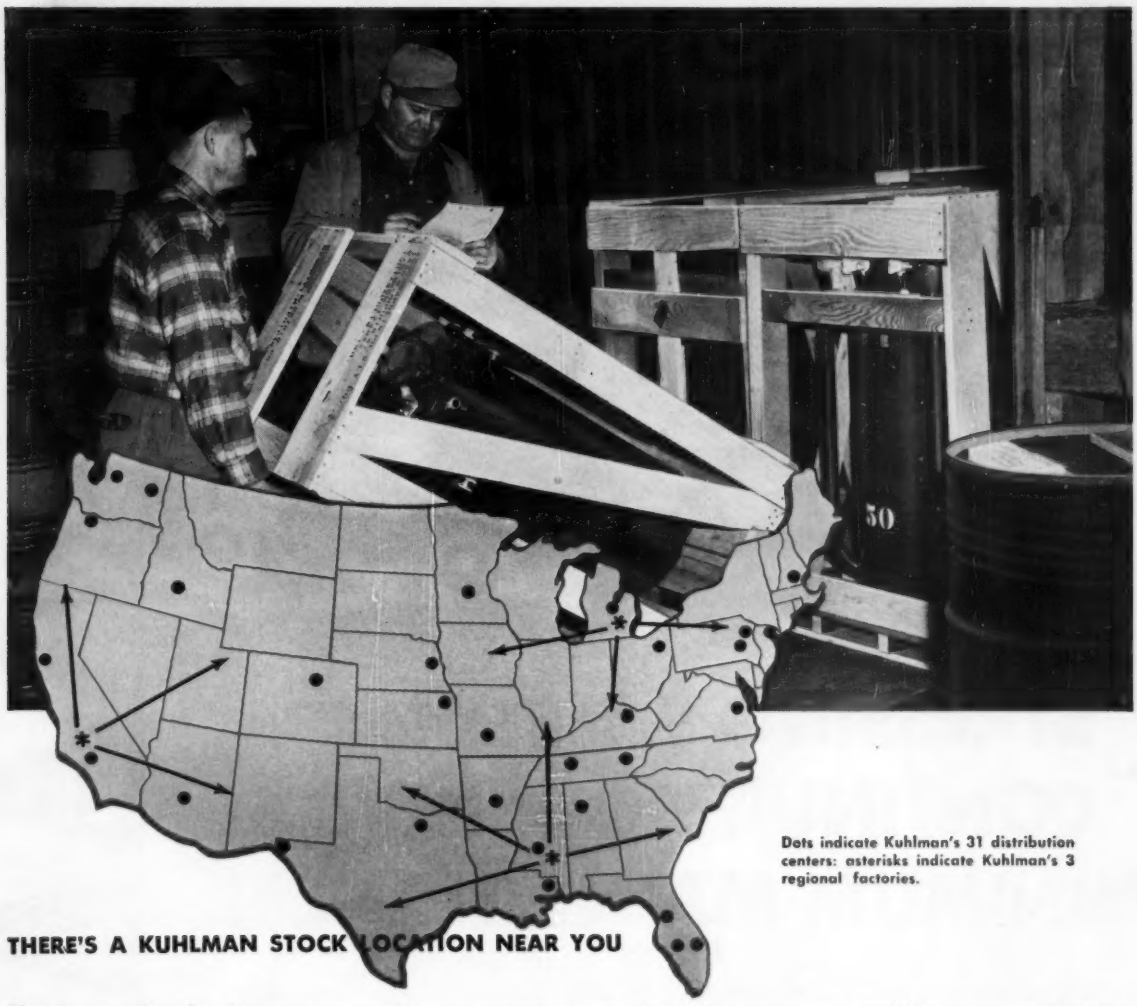

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